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EDITORIAL NOTES.

End of the Residuals Inquiry.

By three o'clock on Thursday afternoon last, Mr. Balfour Browne, K.C., on behalf of the gas industry, and Mr. J. D. Fitzgerald, K.C., on behalf of the Chemical Manufacturers, had said their last words in the historic inquiry which was made necessary by the chemical manufacturers attempting to throttle free trade in the matter of the secondary products of gas undertakings, which secondary products are of their very life-blood in these days of stern competition in every field of their commerce. Whatever may be our individual views as to what we politically call Tariff Reform and Free Trade, there is not one among us who can conscientiously say that he is not in favour of free trade within the country in all commodities in which it is to the economic interests of the community that there should be free trading. "I am standing here as an advocate of free trade in "this country," were Mr. Balfour Browne's closing words to a speech that was full of verve and earnestness for the maintenance inviolate of the terms on which Parliament had allowed gas undertakings to hitherto conduct their business. We cannot congratulate Mr. Fitzgerald in the same terms on the character of his speech. It was plausible in some respects; but it practically ignored the larger questions of the gas industry's case, and hung mainly on detail. It did this however: It helped to reflect in deeper tone one outstanding feature of the inquiry, that in it the gas industry has stood for the people and freedom in home trade; the chemical manufacturers have stood for themselves only, by trying to strangle competition, and to close the doors of open markets which (if not used in the present universally) have the effect—have had the effect in the past—of assisting to prevent injury to gas undertakings and their customers through the establishing of unfair prices.

We cannot here review the mass of evidence given on the part of the gas industry during the sittings of last week; but the consecutive and homogeneous character of that evidence is a matter upon which we heartily congratulate those responsible for it. It showed the vital commercial importance of Parliament refraining from doing anything to accentuate conditions that have already had existence to the detriment of gas undertakings. The ability to compete, as Mr. R. G. Shadbolt put it, secures more or less normal prices from chemical manufacturers; and, as Professor Vivian B. Lewes says, the important point to consider is not what has been the practice of the past, but what will be the effect on the future of legislation such as that indicated in the chemical clause. That is the most important consideration of all. No one who heard the evidence given by Alderman Phillips, Mr. William Kay, Mr. Fletcher W. Stevenson, Mr. A. F. Phillips, Mr. E. L. Burton, Mr. W. A. Schultz, Mr. G. W. Anderson, Mr. T. Berridge, Mr. J. Mogford, and Mr. H. Buckley, and has picked out from their statements certain incidents and experiences of the past in residuals dealings, can possibly come to any other conclusion than that the chemical clause places in the hands of the chemical manufacturers the power to multiply those incidents and experiences to the disadvantage of the gas industry and to their own private advantage. We cannot bring ourselves to think that our legislators, now that they have the facts before them as to the happenings in the past under the freedom of the gas industry, can be parties to deliberately facilitating unfair dealings and oppression; for that is what, put bluntly, market restriction comes to.

The Chairman of the Joint Committee (Mr. J. W. Hills) indicated, by one of his remarks, that his view was that the case of the smaller gas undertakings was different from that of the larger gas undertakings. With all respect, we suggest that there ought to be no distinguishing line drawn between the two. This matter is important to the large undertakings just as to the small ones. If the chemical manufacturers are given the power to secure raw material at low prices by the closing of the markets provided (if there is occasion to use them) by the large undertakings, the larger undertakings who work up liquid products and spent oxide will be placed in unfair competition with the products of the cheaply obtained raw material. If, too, there is to be any discrimination between the larger and the small undertakings, this would, the evidence shows, take from the small concerns the safeguards that the larger undertakings now offer to them. There ought, we deliberately say, to be no classification and no discrimination; for as sure as Parliament takes from any concern, large or small, the ability to compete, and to render local assistance to other gas undertakings, so sure will they enhance the ability of the chemical manufacturers to get material at poor prices. This we cannot conceive Parliament will regard as any part of its duty. The chemical manufacturers pointed to the ability of quite small undertakings to work up their own ammoniacal liquor. The chemical manufacturers know—at any rate, those with sulphate making as part of their business—that the small undertakings cannot work up their liquor so cheaply, and therefore so profitably, as the larger ones; nor can they realize anything like the same quantity of sulphate of ammonia per ton of coal carbonized. This being so, if the small undertakings are forced to work up their own liquor, there again they will be deprived of the benefit of participating in the margin between their own possible profit operating on the small scale and that of the more favoured larger undertakings operating on the larger scale. It is totally impossible, however, for these small gas undertakings to do tar-distilling or enter into the working up of their spent oxide into sulphuric acid. They must in these matters depend on the chemical manufacturers or the larger gas undertakings; and if the latter are removed as possible, and therefore price-maintaining, markets, what will happen? There is only one answer after the evidence given before the Joint Committee.

It was shown in evidence that a large number of gas undertakings are relieving their smaller neighbours of their liquid products. It was also shown in evidence that there are gas undertakings who have sold to other gas undertakings, but are now again selling to the chemical manufacturers. What has produced the change? Competition! The force of competition is therefore not a negligible one; and that "force" is what the chemical manufacturers are desirous of getting rid of by the aid of the Joint Committee and Parliament. It is quite likely that there are chemical manufacturers who would be perfectly willing to pay higher prices for a while to regain some of the business that has passed to gas undertakings. If so, we hope that they will get it. Price and price alone will control (the present conditions being maintained) the direction in which the liquid products will flow and the spent oxide be carried. The evidence distinctly proved the existence of understandings among chemical manufacturers, and the absence in certain territory of competition among them. It also showed that better prices were obtained from chemical manufacturers through the competition of gas undertakings. It is abundantly clear the chemical manufacturers have brought some of the competition upon themselves; it is equally clear that it will be extremely unjust to allow the chemical manufacturers to have a fettered industry with which to trade. If Parliament grants them the power, Parliament will at the same time be removing from the gas industry one of the few remaining channels along which the industry may confidently expect to secure additional economy for the benefit of their gas consumers. We ought not to close this article without directing attention to the excellent evidence Mr. W. Doig Gibb gave regarding coke-ovens as producers of ammoniacal liquor and sulphate of ammonia, which showed that the gas industry is not the only source of raw material for the chemical manufacturers, if they chose to offer a tempting price for it.

At the close of Counsel's speeches last Thursday, the Joint Committee had a private conference; but that this sitting was not sufficient for the framing of their report, is

evidenced by the fact that they are meeting again for further deliberation to-morrow afternoon. For the gas industry, this is too serious a matter for dismissal without the fullest consideration; and we trust that the end will be that we shall be able to congratulate the Committee on the justice meted out by them, through their decision, to the industry.

The Exhibition of 1913.

On all hands, the idea of a huge domestic and industrial gas exhibition in 1913 in a collective and demonstrative form—illustrating not only how the industry has progressed in the efficiency of lighting and heating appliances for all purposes, but how these appliances should be used to obtain the best from them—is being well and enthusiastically received; and from many quarters we have heard the confident belief expressed that a big success is ahead. There will be, if all concerned in the matter do their duty. In this respect as in all others relevant to our industrial life, it is a case of "all for "the industry; and the industry for all." There are yet a large number of gas undertakings who have not made any response to the invitation to contribute to the guarantee fund. It is hoped they will not much longer delay in responding. The extent of the demonstration and the fulfilment of the complete plans rely entirely upon the financial backing given to the Committee of the Institution, the Society of British Gas Industries, and the British Commercial Gas Association. The Committee are working for the industry—not for themselves; and it will not facilitate their purely voluntary efforts if the money-finders withhold an indication of their intentions until (say) a few weeks before the exhibition opens. The earlier, therefore, a definite promise is made the better.

Manufacturers are doing their part. Most of them are exceedingly glad to see the new co-operative spirit that has sprung up in the industry; for they, with ourselves, believe that, under this co-operation, there is greater potentiality in the gas industry than there ever was when the forces were disjointed and scattered. The members of the Society of British Gas Industries met again last Wednesday to discuss financial considerations and detail matters affecting the exhibition. The fact that they have held two meetings recently at which the question has been under discussion shows the enthusiasm and seriousness with which matters of this kind are regarded from their side of the industry. The various sections constituting the Society met separately in the morning, and fixed upon their sectional contributions to the exhibition. They will contribute as sections of the Society; and there will be no competition among the firms in the sections as to which of them is to get the largest amount of *kudos* by the magnitude of subscription. This is true co-operation, and shows the singleness of purpose. In the afternoon, there was a full meeting of the members, under the chairmanship of Mr. Thos. S. Clapham, and with him were the Chairmen of the several sections. The tone of the meeting was excellent. There was no question as to the desirability of an exhibition, nor as to the appropriateness of one in the jubilee year of the industry's central technical organization and the first year of the new century of statutorily authorized gas supply.

The general principles laid down for the scheme of the exhibition [*ante*, p. 647] appeared, from the lines of the discussion, to be approved; but, of course, there are details that must be brought forward and discussed in Committee. The rules that are to govern the exhibition generally must not be too hard-and-fast in character; for it is easy, in a matter of this kind, to see that some injury may be inflicted unless the Committee as a Committee, and not any individual as merely a member of that Committee, are able to legislate for any abnormal circumstance. We can imagine, for example, that, under too rigid rules relating to the collective exhibition and to goods being shown apart from that combined display, some useful speciality, with a sphere entirely its own and solitary in its representation on the market, may be prevented from having fair publicity, if its claims are barred by a too rigorous adherence to rules that may not have contemplated a special exhibit for a special purpose, which has, however, kinship to a class that comes into the collective demonstration.

There is another matter referring to the collective exhibit, which is that the attendants who are appointed must be thoroughly impartial. This is a *sine quâ non* to the existence of a universal feeling after the exhibition that all has been well, and all fairly treated. We know that there have been complaints by manufacturers regarding cases where, though their goods are placed in the showrooms of the gas undertakings concerned, the attendants, with an invariability that does not look well, ignore the claims of those goods, and just as invariably recommend the goods of certain other firms, with the result that orders from those gas undertakings to those manufacturers whose goods are ignored (though there is no question as to equality in efficiency) are such rarities that they cannot recollect when one from those particular quarters reached them. The Committee, however, may be trusted to see that attendants who are strictly impartial are placed in charge of the collective display. If this is done, there can be no after-soreness.

We are pleased to find matters are shaping themselves for the exhibition in correct style; and that the conditions of organization, direction, and supervision are such that implicit confidence may be placed in them, with the assurance that any representations made to the Committee will receive careful consideration. Of course, it will be understood, in this connection, that the manufacturers are in a totally different position from gas undertakings. The latter, in order to support, must subscribe; and their desire is that the very best public-attracting display may be made. The supporting manufacturers have also to subscribe; they likewise want the best public-attracting display made; they also desire equality among themselves; and they want some assurance that their own special class of manufactures will receive, with other classes, due publicity. We can quite understand their anxiety over the details of organization. But once again we say the composition of the Committee is of a safe-guarding order; and the members of the Committee are approachable and representative. But in all consideration of these matters, in all discussion of details, and in all representation, let it be remembered that the capital object of the exhibition is demonstration, with the view to developing gas supply, and, through this, developing all the branches of the industry whose prosperity is drawn solely from the good fortune of the gas-supply trunk.

Importance of Capital-Holding.

The labour upheavals of recent years, and through them the serious interruption there has been of the country's industry and trade, with all the attendant horror and discomfort in our national social system, have done something to make men think, and think more earnestly, as to what is really the cause of all this that should not be, and how best the cause can be removed. Anything that is abnormal is not right; and these great recurring labour troubles and all the evil effects are outside the legitimate order of things. Nothing ought, therefore, to be left undone by all concerned, and more especially by our statesmen, in assisting in the effort to bring about a proper preventative adjustment. We are not of those, however, who consider that there is one means of adjusting affairs so that the radical cause is removed of the trouble that acts destructively on our social, industrial, and economic interests, and that this means should be compulsorily applied by the Legislature to all classes of industry. The Legislature may assist and facilitate; but most of the causes of labour troubles have grown up independently of the Legislature, and they must be largely eradicated, if we are to make industrial peace a more permanent element in the country's work and prosperity, by the mutual action of the parties chiefly concerned. Where the Legislature could assist would be in recommending and informing, and giving the aid of their machinery and resources in producing schemes suitable for the various classes of industry that would contribute to, if not definitely establish, the conditions that would permanently unify the interests of employers and employed.

The best processes within knowledge by which these conditions can be attained, it is now absolutely proved, are profit-sharing and co-partnership; and of the two the latter is the preferable. This has been fully admitted by many of our foremost thinkers and students of social and industrial labour problems; and, in consequence of this, with the impelling force of national strikes and their barbarous consequences close at their side, these thinkers and students have been urging the Government to take some action to help in removing the cause of labour discontent, and to establish those conditions that have proved sufficient in several businesses to assure peace, promote the condition of mutual interest, and make employers and employed loyal one to the other. Profit-sharing and co-partnership are things that are

not merely in the abstract, but are of a concrete and, being concrete, permanent order. We see this in the report that has just been issued, and which has been prepared by Mr. George S. Barnes of the Labour Department of the Board of Trade. In this, he has brought together a mass of information quite up to date concerning schemes in existence and defunct, without himself expressing any opinion concerning them, but leaving facts and experiences to produce their own impressions, teach their own lessons, and promote what we hope will be ultimate good effects to the advantage of the whole country.

There is no doubt that opinion is drifting, and with opinion practice, from simple profit-sharing to co-partnership so far as there has been application of the one or the other; and we think that it is quite plain from the report why this is so. Co-partnership is an extension of profit-sharing which (so runs the definition in the report) enables the worker to accumulate his share in the capital of the business employing him, and thus gain the rights and responsibilities of a shareholder. The conferring, or the establishing, of these rights and responsibilities are of the very foundation of permanence, and of the very ground from which the good effects spring that supersede the evil of disruption between employees and employers. In many other businesses besides that of gas supply, where simple profit-sharing was started with a cash distribution, we see from the report that they are gradually veering round to the greater stability that is given to any scheme by a shareholding interest. The gas industry has been a pioneer in many ways; and we think it may be claimed to have been a pioneer in proving, in a substantial way, that co-partnership has a higher claim to our respect as an effective agency than simple cash distribution under profit sharing. The investigation of principles and effects was not very long in convincing the presbytic Sir George Livesey of this fact.

This extension of profit-sharing to capital-holding has been a movement of recent years (we are not here talking of what is known as the co-operative system, as that is quite another phase of the question); and the effect is seen in the permanence of the schemes that have been started with this in view, or that have developed in this direction. According to the report, there are 106,000 workers in the country in the enjoyment of profit-sharing, or the more tangible and lasting results of co-partnership. Of this total 28,246 are gas workers; so that the gas industry may claim about 27 per cent. of the total industrial workers of the country who are participating in these advantages, and who are, as a result, contented. It is almost impossible to tell from the report what individual industries come next in order to the gas industry in the number of beneficiaries, inasmuch as they are grouped. But the combined forces of engineering and shipbuilding come next quantitatively with 17,336 employees, receiving profits over and above wages. Chemical, glass, pottery, &c., industries stand next with 15,649. There are 33 gas company co-partnership schemes in existence according to the report (35 actually); and this is a growth from only four in 1907. The 33 companies (confining ourselves to the figures in the report) represent no less than 49 per cent. of the gas manufactured in the United Kingdom; so that practically one-half of the gas business is protected by co-partnership and the other half is not—this being largely due to the impracticability of producing for municipal gas enterprise a scheme that is the cognate of co-partnership with its fundamental principle of capital-holding in the business producing the profit. But we certainly do object to these co-partnership schemes of the gas industry being regarded at the present time in the light of experiments. In one place in the report the schemes are referred to as "experiments;" we do not want that idea to get abroad. They are too mature and solid to appear any longer under such a designation. We have to go back to 1889 to get to the inauguration of the scheme of participation at the South Metropolitan Gas Company's works, which developed into full co-partnership as we now know it; and, in all conscience, the material position of the Company's scheme to-day, and of those of others that followed, is sufficient to remove them from the category of experiment. According to our measure of life, 23 years is a good part.

The total number of businesses under profit-sharing or co-partnership mentioned in the report is 133; and 33 of these are gas company schemes. But so far as can be traced, there are 163 schemes that have been abandoned. Now when these figures are examined a little closer, one obtains an insight into the permanence that capital possession gives to a scheme of this kind—this being the line of development of profit-sharing that has been so marked the last few years. Of the 133 businesses under existing profit-sharing or co-partnership, 81 of the schemes have started since 1901. Of the 163 schemes that have been abandoned, only 13 have been given up since 1901. Of the 13 only one has been a gas company—the Carmarthen, who only had the scheme running from 1909-11, and merely 19 employees were interested in it. The Directors abandoned it because they were dissatisfied with the results. That was a case in which the distribution was made in "cash" only; and we have the significant information that of the 163 failures mentioned in the report, no less than 121 were schemes in which a cash payment was made. These figures are particularly instructive; and they point to the fact that a cash payment still keeps the worker outside the gates so far as interest is concerned. There is not the internal interest and the link of mutuality in a cash payment that there is in participation in capital. It was the view of Sir George Livesey that these schemes could not be a success unless properly established. He proved that they could be made successful by being properly conditioned. If schemes fail, there must be some defect in them. That is asserted by the success of other schemes; and such successes support the view of the possibility of a wider application. The part of the gas industry that is under co-partnership would not return to the old ways. The success in its case, the success of modified schemes in other industries in which capital participation is incorporated, makes those with the country's social and industrial prosperity at heart ask whether it is not worth while to make a serious effort to fit co-partnership to other industries. We think it is.

In the Interests of Eyesight.

THERE is some reason for the existence of all changes and developments. There is reason for the existence of indirect and semi-indirect systems of lighting. They owe their origin in their present forms to defects—the defects of incandescent electric lighting, which more than any other illuminant (and particularly in the metallic filament form) have an ill-effect upon the human eye. This is the true reason; but the public are not informed of it—in fact, the electricians try to make as light of it as possible, and charge the incandescent gas mantle with like effects, though they know full well that the area of an incandescent mantle is considerably more than the area of the tungsten filaments in lamps of equal candle power. They find it difficult to play an honest game while on the horns of a dilemma. They have either to keep from the consumers the evils of using naked filament lamps; or if they boldly tell them of the evils, they have to confess that, to render the lamps innocuous, they must be installed on the semi-direct, semi-indirect, or indirect systems, at a greater cost, and that the running expense will be higher to obtain an equivalent illumination on the working plane. That one of the three systems of installation must be adopted with modern electric lighting was confessed by more than one of the speakers during a discussion on the subject at the meeting of the Illuminating Engineering Society last Tuesday, when two electricians presented a paper on the subject. We know that some people like the indirect system of illumination from the ceiling; but that "some" is of the few. There are others who prefer the semi-indirect or semi-direct with respectively translucent or prismatic glass bowls below the lights. A demand has sprung up for this latter form of lighting with inverted gas-burners; and a very pretty effect one gets. But, of course, this means more in first cost than fitting up in the usual way.

However, we are speaking of the ordinary consumer; and with electric lighting, he has to choose between impairing the eyesight and the adoption of a semi-direct, semi-indirect, or indirect system of illumination. If he adopts the indirect system, he must be prepared to suffer from that coldness, flatness, and absence of cheerfulness of which so many—the many including electricians—complain. He must also be prepared to pay more for a given amount of illumination. It is all very well for advocates of indirect lighting, with a commercial interest in a system, to tell us that with it a lower foot-candle intensity is required on the working plane than with direct lighting. We have tried it—tried it for reading; and the eye-strain was more than we preferred to continue. Moreover, if only the same quantity of energy is consumed with indirect as with direct lighting, the gloom, with the indirect system in the lower part of the

room, soon gets on one's nerves. We are not all so insensible to the influences of light and life that we can afford to dismiss them with the callousness of those who have a commercial interest in such indirect systems of lighting. It is necessary, if there is to be a sufficiency of light at the working level, that more energy must be used with an indirect system. At the meeting there was plenty said as to the awkward position in which electric lighting is in connection with these matters. Returning for a moment to what one electrician called the "incredible discomfort of naked tungsten lamps," Mr. W. M. Mordey referred to a previous occasion when he had spoken of the "whiplash" on the eye of the metallic filament lamp; and he said that the "GAS JOURNAL" had "blamed" him for this. We are extremely sorry that Mr. Mordey has mistaken our commendation of his candour for blame. Perhaps he read our comments in a room lighted by an indirect system; such rooms according to electrical report seem to have peculiar mental effects on different people.

One other point about the use of bowls for the semi-direct, semi-indirect, or indirect systems of lighting. They are suspended near the ceiling. And they make good harbours for travelling dust. In the West-end with the dust—dust produced by the street traffic—and smoke-laden atmosphere, there has, we know, been a good deal of trouble with the lamp-bowls suspended out of reach near the ceiling. They require dusting as frequently as any other part of the furniture and fittings in the room. But their inaccessibility, without incurring trouble, protracts the time of their cleaning. It is now proposed, by those whose mission it is to cultivate a public taste in these systems of lighting, that, in lofty rooms, some simple gearing should be fixed so as to raise and lower each fitting for the purpose of cleansing. Another expense chargeable to the high intrinsic brilliancy of the tungsten lamp! Another eyesore where such gearing is applied!

New Lights for Old in the Outer Suburbs.

In last week's "JOURNAL," in an editorial headed "What of the Suburbs?" reference was made to the assistance gas companies can be, by mutual arrangement with the tradesmen, in improving the attractions, through high-pressure lighting, of the shopping parts of districts lying around large shopping centres. West Norwood and what the South Metropolitan Gas Company are doing there in collaboration with the local tradesmen were given as an illustration. Last Saturday night saw the whole of the main shopping street of West Norwood absolutely transformed. From a very dreary-looking street at night time, it was brilliant with light. Long unbroken stretches of shops were illuminated by the new system—the tenants having simultaneously entered into the scheme. Some of the shops that formerly had outside electric lamps have abolished them in favour of the high-pressure gas-lamps; and at least one shopkeeper has found his window so luxuriantly lighted by the new exterior lamps that he has also discarded interior window lighting by electricity. In fact, most of the shopkeepers find it totally unnecessary with the new lamps to have lights among the goods in the window; and this is both an advantage and an economy, as now the lights do not interfere with the window dressing. The transformation the Company have effected in this outer shopping area must be beneficial in inducing the people of the locality to stay and patronize their fellow ratepayers, and not take such large advantage as they have lately been doing of cheap tramway locomotion to get to other attractive shopping centres. We congratulate the Company upon the rapidity and completeness with which they have carried out the work, and changed the night aspect of the trading part of the district. On what is known as Sydenham Parade, the South Suburban Company have a scheme in hand that is to be finished for the Christmas shopping week.

Suggestions for Municipalities.

A thoughtful article was contributed to a recent issue of the "Municipal Journal" by Mr. G. H. Brown, the Accountant and Deputy Clerk to the Leigh-on-Sea Urban District Council, in which the writer dealt with some of the aspects of municipal trading, and made a couple of suggestions for meeting what he regards as probably the most formidable argument against municipal trading—*i.e.*, that the committeemen responsible for the carrying on of the undertakings, having no specific stake therein, lack the incentive which is the stimulus to the company director. Even this difficulty, which he regards as much exaggerated, Mr. Brown maintains is not an insuperable one, inasmuch as it would only require legislative sanction to make a minimum stock-holding a *sine quâ non* to membership of a trading committee. Of course, such an innovation would only require legislative sanction to bring it about; but some of the considerations that would arise might not prove universally acceptable. For instance, unless the minimum stock-holding was placed at a very small figure, it might give rise to a feeling of grievance in some quarters—bearing in mind present-day tendencies. Payment of members would, the author suggests, still further ease the difficulty. Presumably this payment is only intended to apply to the members of the trading committees; and if so the fees would be a charge against the undertakings they administered. The principle of payment of members having been conceded by Parliament, it might not be easy to argue successfully against its extension in this way. But in connection with some of the less successful municipal undertakings, the opinions of ratepayers on the subject might be interesting. So might the opinions of some officials on the following statement: "So long as municipalities are afforded the same economic opportunities, and are in a position to command the same engineering, secretarial, and other talent, they are in a position at once superior to their rivals. They can get their officials more cheaply. Municipal salaries are strictly limited; so are the risks attaching to municipal employment. Private enterprise offers greater pecuniary inducements, but tenure of position is much more precarious."

The Milch Cow of Industry.

It was only in October that, by mutual agreement, an advance of 5 per cent. was made in the wages of the coal miners; and already, at a meeting of the miners' section of the Coal Conciliation Board for England and Wales, a resolution has been passed asking for an immediate further advance of 5 per cent. The men urge that they are justified by what they describe as the present "high" selling price of coal, and the rates at which coalowners are making their forward contracts. It is not at all likely that the owners will accede to the request of the men, on the ground that modern legislation has gravely added to the cost of production; and the probability is that this new application will be referred to the independent Chairman of the Board, Lord Coleridge. Another matter is the trouble with the railway companies. It will be remembered that, at the time of the national railway strike, the Government promised the companies that they would introduce legislation empowering them to make good, by additional charges on traffic, any concessions made to the men. The Government seems to have dallied with the matter; and the railway companies have been fretting and somewhat importunate under the delay. In a spasmodic way, the Government have been making signs of meeting the companies. One Bill has been introduced; it is now a dead letter. A second Bill was introduced by the President of the Board of Trade the other day. But the Government know there is little chance of it passing this session—more especially as it is understood that the trading interests are bitterly opposed to it. It is stated that it is quite on the *tapis* that the Government will drop the measure unless there is agreement over it.

Outstanding Loans.

When noticing recently the accounts of the borough councils outside the Metropolis, for the financial year to March 31, 1911, it was pointed out that the total amount of the loans outstanding at the end of this period was £255,500,000, compared with nearly £252,000,000 at the close of the preceding year. We may now add to this the outstanding loans of the urban district councils, which at March 31, 1911, totalled £35,543,565, against £37,068,134 twelve months before. In the case of the borough councils, very nearly one-half of the amount represented loans on account of the four principal classes of reproductive undertakings—gas, water, electricity, and tramways and light railways; and with the urban district councils concerns of a like nature represent considerably over one-third of the total debt. It is to be noted that, while there was an increase in the outstanding loans of the borough councils for the twelve months to March, 1911, the urban district councils have decreased their total to an appreciable extent, though it must be remembered that the figures in both instances are affected from time to time in varying degrees by changes in the authorities

concerned—namely, the creation of new district councils and the merging of existing ones into boroughs. However this may be, it is pleasing to see in the Taxation Returns, from which the figures are gathered, a reiteration of the statement that of recent years there has been a distinct slackening in the rate of increase of the debt of the urban district councils. At March, 1902, their outstanding loans were £25,793,505; at March, 1906, £34,472,307. A year later the figure was £35,622,307. But after the lapse of a further four years—in March, 1911—this total actually showed a small decrease, to £35,543,565. In other words, while in the five years to March, 1906, there was a rise of 33·6 per cent. in the total debt of the councils, in the succeeding five years, to March, 1911, there was a decrease of 0·22 per cent. Of the outstanding debt shown in the present returns, £3,294,870 is on account of gas-works in the hands of urban district councils.

PERSONAL.

Mr. HENRY TALBOT, the Gas Engineer and Manager of the Todmorden Corporation, has relinquished the position in order to take the post of Manager of the gas-works at Holyhead.

The Corporation of Nottingham have decided to confer the honorary freedom of the city upon Sir EDWARD FRASER, who recently resigned his position as Alderman and as Chairman of the Derwent Valley Water Board.

The Chard Town Council have appointed Mr. H. D. LUMB, of Yeovil, Gas Engineer and Manager, in succession to Mr. A. S. Brook, who, as stated last week, is leaving to take up a similar position at Lisburn, Ireland. There were 90 candidates for the position, in response to the advertisement in the "JOURNAL" for the 26th ult.

On returning to Bahia after a holiday, Mr. A. SHERRET, of the Bahia Light and Power Company (formerly of the Windsor Gas-Works), was met by a deputation of the workmen, who escorted him to the works, where confetti, fireworks, and speeches were followed by the presentation of an address and other gifts. On the address were the words: "A Remembrance from the Employees of the Gas Factory of Bahia, to our Dignified Master and Friend (A. Sherret), on his return from Europe."

The versatility of the gas expert is proverbial, and a striking example of this is shown by Mr. HENRY O'CONNOR, of Edinburgh. One of Mr. O'Connor's hobbies is work with the Territorials, and his rank is Lieut.-Col., commanding the Forth Royal Garrison Artillery, consisting of six companies. This year it has the highest average figure of merit for big gun shooting of any Territorial unit in Great Britain; and, moreover, it is the leading coast defence Territorial Artillery corps in Great Britain. It may, therefore, be presumed that, if ever the day of trial does come, Lieut.-Col. O'Connor and his men will give a good account of themselves.

OBITUARY.

The sudden death occurred on the morning of the 1st inst. of Mr. THOMAS BOWERS, of Stockton Heath, Warrington, the Works Manager for Messrs. Fletcher, Russell, and Co., Limited. Deceased appeared in his usual health on returning home the previous evening; but shortly before midnight he had a seizure, and never regained consciousness. Mr. Bowers, who was fifty-five years of age, was highly esteemed in Warrington.

We much regret to record the death, on the 27th ult., of Mr. JOHN MOIR, who had been Secretary to the Chertsey Gas Company for forty-four years. During this long period he never missed attending a Board or annual meeting until the illness overtook him which resulted in death. His great wish was that he should be present at the last annual meeting, which was the Jubilee of the Company; but this was not to be. He died twenty-four hours after the meeting. Deceased possessed a charming personality, and was greatly respected not only by the Directors but by all who worked with him. He was born in Chertsey, and lived there all his life. For sixty-six years he was a chorister in the Parish Church. The first portion of the Burial Service was held at the church; the full choir being in attendance.

Coal-Naphthalene Briquettes.—The following appeared in a recent number of "Engineering": "Briquettes are prepared by mixing coal with some binding agent—as a rule, pitch. Pitch is not an inexpensive material, however, and when a poor coal does not yield tar and pitch in sufficient quantity, and the pitch has to be bought, the cost may become too heavy for the manufacture of briquettes to be profitable. This is so in the case of some Rhenish-Prussian collieries, especially in those which, not belonging to the Coal Syndicate, have to pay high prices for their pitch. Hence the attempts at replacing part of the pitch by some other material—*e.g.*, naphthalene. Naphthalene alone would hardly be suitable, and, moreover, would be too expensive. But it has been found that a small amount of naphthalene may be substituted for a larger quantity of pitch.

ELECTRICITY SUPPLY MEMORANDA.

Untruth in Electrical Advertisement—Intrinsic Brilliancy and Eye Injury—Heating and Cooking—Radiator Experiences at Southampton—The Fatal Dose—Doubts on Indirect Lighting—Burner and Lamp Efficiencies—Hove Municipalization Question—Natural Light Imperatively Necessary.

THE ethical side of commercial life seems to have undergone a vast change for the worse since our electrical rivals entered the lists. It was the Psalmist who, in doleful mood, said that all men are liars; we hesitate to think what he would say, were he here to-day, of some of the sayings of electrical people in their attempts to secure additional patronage from the public. An electrical advertisement that appeared in the "Manchester Courier" for the 29th ult. has just been perused; and we are both sorry and pleased to say that we are in disagreement with certain of the statements it contains, which are samples of what is all too frequently seen in electrical advertisements—sorry because we have some humane feelings regarding the future of these electrical people, and pleased because we know the statements we have in view are demonstrably untrue. For instance, one is that "recent improvements in electric lamps have brought the cost of electric light below that of gas." The extent of truth and untruth that there is in this statement depends on the gas-burners employed, and on the cost of the gas. If the writer of the statement is making comparison with a modern inverted gas-lamp, and with gas at the normal lighting prices of our cities and towns, and not the price in some out-of-the-way hamlet, then we assert, and (as "Meteor" of the "Electrical Times" and Mr. Cramb of Croydon, are fully aware) are prepared to prove, if Mr. Cramb will accept the conditions, that the writer in the Manchester paper is saying something that is deliberately false. It is also said that even at 1d. per unit "electricity is *very little dearer* for heating and cooking than gas or coal." If the writer knows anything of the modern gas-fire and its efficiency, and has thoroughly investigated costs and temperatures with such fires and electric-radiators, he must know that that "very little dearer" is not in accordance with the truth as applied comparatively to electricity and gas for heating purposes.

The remarks that have been quoted are in the preliminary part of the advertisement in the "Manchester Courier." More extended reference is subsequently made to electric lamps, heaters, and so forth. In connection with lamps, it is stated that, by substituting for carbon filament lamps drawn-wire metallic filament lamps of the same size, a consumer can "reduce his lighting costs by 70 per cent." We have seen, and very properly, in the electrical press protests against any similar essay at trading on the section of the public who are susceptible of being gulled by talking to them of savings of three-quarters of their lighting bills. It is known very well that consumers who change-over from carbon filament lamps to the later comers do not find that their accounts are reduced by 70 per cent. nor anything like it, and more particularly is this the case with those who go in for reflected lighting or the other essential methods of protecting the eyes from the injury occasioned by modern naked electric lamps. This is a subject that is dwelt upon in the advertisement; and it is about the only thing that we can applaud in it. It is pointed out that improperly placed lamps not only give a poor light, but they may have physically harmful results. In the direct line of sight, it is said, "the glare from a brilliant lamp filament is likely to irritate, if not permanently injure, the visual nerves." There is truth in that. But is there not a substantial piece of deception when it is added: "This, of course, is *equally* true of gas, or any other illuminant"? It is not "equally" true; and the electricians are fully aware of it. If they are not, then they ought to be; and those who are not we strongly advise to study the text-books that show the intrinsic brilliancy per unit of incandescent area of electric and gas lamps. To overcome the serious defect in this respect of the filament of electric lamps, scientifically designed reflectors are advised, or indirect lighting from the ceiling. What then of the 70 per cent. saving in cost under the conditions necessary to hygienic lighting? The writer of the advertisement indicates his feelings as to the importance of completely keeping the electric filament from the human eye, inasmuch as he says that the chief feature of the indirect form of lighting is "the total invisibility of the light source, which is a distinct advantage from the hygienic standpoint."

We now get back again to electric heating; and the optimistic writer sees no reason why the electric heater should not become the universal domestic warmth giver. Such a robust faith is worthy of a large reward. But people like value for money; and there are many who have been led away by the subtle arguments of the electrical canvasser or showroom man to try electric heating who have afterwards found that costs and heating value are so widely separated that they have called in the gas-fire to take the place in service of the electric radiator. People have learnt, too, that open fires that assist in creating movement of the air in rooms are the healthiest means of heating that can be employed. Dr. Leonard Hill has been preaching this; and Dr. Leonard Hill, we believe, is now a user of modern type gas-fires for domestic heating. There are in the advertisement some vague statements as to the cost of electric cooking; and that glorious old assertion—much paraded, but never proved by the electricians in open

competition—again appears, that there is less shrinkage of meat when cooked in the electric-oven than in a gas-oven. In the gas-oven we are not limited to any one temperature; we are not limited to any one method of baking. We can regulate temperatures to any point desired. We can bake in the open oven, in enclosed tins with regulated ventilation, in casseroles, in paper bags. The electricians know of all these things; they know of the large temperature and method ranges of the gas-oven. Like obstinate children, however, they still prattle of the retention of more water in an electrically cooked joint than in one gas-cooked. Their difficulties are reflected in their childishness in declining to recognize facts. Does Mr. S. L. Pearce, the Chief Electrical Engineer of the Manchester Corporation Electricity Department, subscribe to all the statements in this advertisement, and to the puerility to which we have pointed? We know that he was stating not long since [*ante*, p. 568] that, after the alterations he had made in the Portland Street trial flame arc lamps, there were people who thought that 6000-candle power lamps had been substituted for the original 3000-candle power ones. How stupid of those people to be so deceived!

We get from electrical theory regarding heating to solid practical facts when we turn to a report of the proceedings at a recent meeting of the Southampton Town Council. The Electricity Committee are very dissatisfied with the results of letting on hire electric-radiators. The majority of these things cost from £2 to £2 10s.; some of them more. They have been let on hire at 1s. per quarter, without any agreement as to the length of time they are to be kept. Mr. Kimber told the Council, in asking the members to agree to a higher charge being made for hire, that in "many" cases the radiators were returned—coldly and mercilessly given up—with simply a fortnight's notice, and then they were lying idle. There is not much encouragement in this sort of thing for the Electricity Department; but what are the poor users to do? They cannot be expected, when there are several degrees of frost about, to sit and shiver even to please the Corporation Electricity Department. The only thing to be done is to give up the radiators, and adopt a more generous method of heating. The department have been considering how they can make householders a little more chary of adopting radiators on hire, and how they can obtain a better hold over them. The Council have agreed to this course: To raise the hire from 1s. per quarter to 2s. 6d. per quarter for radiators costing up to 50s., with an addition of 25 per cent. on all radiators costing above 50s. The minimum period of hire is henceforth to be twelve months, with a quarter's notice on the part of the consumer of his intention to abandon electrical inefficiency for gas efficiency in the matter of heating. This experience does not look as though electric radiators are held in high esteem at Southampton, where current for heating is at a very low charge—in fact, the Electrical Engineer is a "Point-Five" man. The want of esteem, however, is not uncommon, so that the Committee need not think the householders of Southampton are any more inappreciative of the word-inflated virtues of electric heating than residents are found to be in other towns.

It is remarkable what a large amount of ignorance exists as to the danger of electric current at low voltages. Attention has been again directed to the matter by recent occurrences, as readers will have seen by references in the "Memoranda." Not long since Professor Jellinek, of Vienna, was lecturing on "The Dangers of Electricity from the Clinical, Forensic, and Hygienic Points of View." The ground of his discourse was wide and broad; and there is no doubt the learned Professor did not lack for material. He cannot agree with those who see no danger in currents of 300 or 350 volts. Small wonder when he has had before him various fatal cases with 100 volts; and he has even seen a death where the current was only 65 volts. There is the same difficulty when attempting to determine the fatal quantity of amperes. Electricians are in the habit of regarding a tenth of an ampere as safe; but so small a quantity as a thousandth may, in the Professor's opinion, prove fatal. The skin of the body is a great protector against electricity, as it is against other dangers, but the resistance of the skin is a varying quantity. Experiment has shown that the electric current passes both over and through the body; and it makes a considerable difference whether the current is taken by accident or knowingly. It is possible, the Professor says, for a man to take current at between 100 and 1000 volts if he does it knowingly, whereas if he takes the same amount unwittingly at another time it might prove fatal. It is necessary to realize that surprise plays an important part in deaths from electricity; and it is because of the absence of shock that electrocuted prisoners do not at times lose consciousness. Electrical people are not talking so confidently of the safety of low voltages to-day as they did at one time. Evidence of danger is at present too strong for them.

In the "JOURNAL" last week, it was seen that "Meteor" of the "Electrical Times" had had another peg at the Council of the Institution of Electrical Engineers over the dead illumination and stagnant air conditions of their lecture theatre. He is applauded for this by Mr. Charles A. Baker, in a letter to our electrical contemporary. Mr. Baker points to another disadvantage, besides the dead, flat, appearance of indirect lighting—that with it it is necessary to have a higher degree of illumination than with direct lighting in order to be effective, and this means money. Speaking of the Institution theatre, Mr. Baker says he does not know the actual foot-candles that would be indicated near the floor-level; but his own experience is that 2 foot-candles of direct lighting must be replaced by 4 foot-candles of indirect lighting to produce an equally pleasing effect. "No one would expect to obtain economical or efficient lighting from an indirect system under the best conditions. At least four times the expenditure of energy is necessary to obtain results comparable with direct lighting; but having regard to the decreased reflective surface at the Institution owing to the mahogany panel work being carried round the base of the cove, above the line of lights, a much greater margin of illuminating power is necessary to produce reasonable brilliance. When these facts are carefully considered, one is inclined to have some doubts as to whether the game of inverted lighting is worth the candle." If we had said as much as this, there would have been trouble with someone.

While mentioning the "Electrical Times," we see that "Meteor" spreads himself out under the heading of "Exeunt Gas Efficiencies." "Ridiculous claims" and "scientific standpoint," "conspiracy of silence," and a few other choice morsels show the wild state into which our friend has worked himself up over the matter. We know from past experience that, on this subject, from the "scientific standpoint," "Meteor" does not shine brilliantly. He will not find anywhere in our columns that makers have claimed 33 or 40 candle power per cubic foot from a "gas-burner;" the claims for these higher duties have been for gas-lamps, including burners and all parts that go to contribute to the attainment of a high efficiency. We asked "Meteor" a little time ago to prevail on Mr. Cramb, of Croydon, to accept a challenge of ours in connection with the matter of inverted gas-burner efficiency and cost in comparison with metallic filament lamps of equal candle power, conditionally on the results being published in Croydon and elsewhere with Mr. Cramb's signature attached, attesting the accuracy of the results. What shall we say, "Meteor:" "Cramb Accepts," or "Exeunt Cramb and the Boast of a Cheaper Light?"

The Hove people who are in favour of municipalizing the electricity supply are trying hard to make the decision of the Council, arrived at by a majority of one, screen the awkward position in which the project rests, owing to the large and sensible opposition that there is in the borough against the Council trespassing upon the legitimate land of private enterprise. The Town Clerk, in an interview with a Press representative, has been talking of what were the intentions of the Council twenty years ago when they parted with their powers to the Company created for the purpose of taking over the concern. He says that it was the fundamental policy of transfer that the undertaking should be re-transferred in time to come. If this was so, it was of an abstract nature; for nothing definite has been disclosed in the way of a recorded promise or an undertaking. The transfer at that time, according to the present submissions, was in order to allow the Company to do all the pioneering and spade work; and, when they had done so, for the Corporation to exercise their own sweet will and step into possession. Twenty years may make a vast difference in the position of matters; and the views of councillors of twenty years ago had no right to be brought up as binding the councillors of to-day to any action of this kind. However, by a majority of one, the Council are proposing to purchase by paying the full capital expenditure, for plant twenty years' old, and a heavy necessary capital outlay for modernizing things. There are ratepayers who do not think this is good enough. We do not blame them. Let municipal councils stick to local government; private enterprise to trading.

An article which constitutes a protest against the practice of certain of our Continental neighbours in taxing artificial lighting agents has appeared in the "Electrical Review." We are fully in accord with the opinions on this matter of our contemporary. There is, however, one queer sentence in the article which requires a little elucidation. "Natural lighting," says the philosophic writer, "is a free gift which has, by our evolution, become imperatively necessary to us." We rather think that our forefathers in the distant past found natural lighting an imperative necessity without taking into account any question of evolution. Of course, our friends of the "Review" may be able to show that we are mistaken.

The German Illuminating Engineering Society.

The "Illuminating Engineer" for the current month contains a translation of the official announcement, in the "Zeitschrift für Beleuchtungswesen," of the formation of the above-named Society, to which reference was made in the "JOURNAL" last week. According to the rules, the aim of the Society is the furthering of the science of illumination, both in theory and practice, and, in particular, "the concentration of the efforts of various circles interested in illumination in Germany and other countries; and the representation of the German lighting industry in international relations." Ordinary meetings are to be held from October to May. The annual meeting will generally take place in the autumn, outside Berlin; but the first will, as stated last week, be held in February, and it will be in that city. The proceedings will be published in the above-named German paper, and also in the "Journal für Gasbeleuchtung" and the "Elektrotechnische Zeitschrift." It is said that the foundation of the Society is "a milestone in the path of development of illuminating engineering in Germany;" and it is considered that "through its influence, and by the friendly co-operation of the formerly conflicting interests which it will bring about, together with the special assistance of independent experts, the movement will no longer be confined to foreign countries."

LABOUR DISPUTES DURING 1911.

It is noteworthy that, simultaneously with the appearance of the report of the Labour Department of the Board of Trade on Profit-Sharing and Co-Partnership (to which attention is being devoted in the news columns of the "Journal" to-day), there was issued a report of the same Department on "Strikes and Lock-Outs and Conciliation and Arbitration Boards in 1911." This latter report is an annual publication; and the present one, which is the twenty-fourth volume of the series, bears the signature of Mr. G. S. Barnes. A few figures may be given now from the first portion—that dealing with strikes and lock-outs.

When noticing more than twelve months ago the statistics for 1910, it was pointed out that less favourable figures were to be expected for the next year; and this view has been amply verified. The total number of disputes in 1911, and the number of workpeople involved, were far higher than any other figures recorded for the past ten years. In fact, the number of disputes was exceeded on only two occasions during the period from 1893 to 1910; while the total number of workpeople involved was more than 300,000 in excess of that for 1893, which was the highest previously recorded. For this condition of affairs disputes in the transport trades and the cotton-weaving industry were mainly responsible; the principal causes of trouble being questions of wages and trades unionism. The number of persons involved in all disputes in the transport trades last year was 448,618, and in the textile trades 221,433; while of the aggregate duration of disputes in progress during the period under review, the former trades accounted for 2¾ million working days, and the latter for 1½ million. A further 2 million working days were lost by a coal mining dispute which commenced in 1910. Questions as to wages involved 46 per cent. of the workpeople directly affected last year by disputes, and points as to trade unionism 39 per cent. Taking the year as a whole, no less than 903 disputes were recorded, involving 961,980 workpeople at the establishments where they occurred. In addition, 27 disputes which began before 1911, involving 26,720 workpeople, were in progress for varying periods during that year. Of last year's disputes, 99 were in connection with the transport trades; and two-thirds of all the disputes began in the second half of the year. In the coal-mining industry, the number of disputes beginning last year, though greater than the average of the past ten years, showed a considerable diminution as compared with the two previous years. The number of people involved in disputes in the metal, engineering, and shipbuilding trades was considerably higher (with the exception of 1897) than for any other year since 1893. However, though the total number of workpeople involved in all disputes in 1911 was higher than any previously recorded by the Department, the proportion affected of the total number of persons engaged in industrial occupations was no more than 9 per cent. This compares with 4·9 per cent. in 1910, and 2·9 per cent. the mean for the past ten years.

Making a rough calculation, the aggregate number of working days available for the whole industrial population (exclusive of agricultural labourers) may, says the report, be put at rather more than 3100 million; and the aggregate duration of all the disputes in progress during last year amounted to 10,319,591 working days, or about one-three-hundredth of this total. Putting it in another way, the amount of working time lost owing to disputes in 1911, at the works immediately affected, would have been about one day per head if spread over the whole industrial population. In the coal-mining industry, the average loss of time was about four days per head, and in the metal, engineering, and shipbuilding trades nearly one day per head. Nearly one-half of the total number of disputes lasted less than a week. There were, on the other hand, 73 disputes, all comparatively small, which were in progress for a period of two months and over; and of these twenty were in the coal-mining industry, and twelve in the engineering trades. As already remarked, the principal cause of dispute was again the vexed question of wages—there being many demands for advances. Of 87 disputes over questions with respect to the re-adjustment of rates of payment on account of difficulties in working, &c., 32 were in the coal-mining industry, and arose mainly over rates of payment for working in abnormal places. Trades union principles, too, are always a "bone of contention;" and they were chiefly responsible for two of the largest disputes of the year—the general railway strike and the cotton-weaving lock-out. Many smaller disputes of the same character occurred in other trades; and of these the report remarks that the only point worthy of note in reference to any particular industry is the marked diminution in the number of such disputes in the coal-mining branch as compared with 1910, in which year a large number of disputes occurred in South Wales and Monmouthshire, owing to the efforts of the South Wales Miners' Federation to compel all non-unionists to join that body. Demands for a decrease in the hours of labour did not account for any large proportion of the disputes; but eleven disputes (ten of which were in the engineering trades) occurred owing to labourers taking the place of skilled workers. Purely "sympathetic" strikes numbered ten; but it is pointed out that this figure gives only a slight idea of the extent of the application of the sympathetic principle to the disputes of the year. The principle was, in fact, applied in many cases; and when once the workers were out, they formulated demands for improvements in conditions, which then became the substantive objects of the strikes.

As to the results of last year's labour conflicts, it is learned that the great majority of workpeople involved in disputes arising out of claims for increased wages were only partially successful in obtaining their demands—though most of these partially successful ones secured considerable concessions, comprising not only advances in wages, but in many cases reductions in hours of labour and various other improvements in working conditions. In disputes over trades union principles, the two big cases ended in compromise; but in minor disputes of this nature a majority of workpeople involved were successful, mainly owing to the large measure of success attending strikes which occur with the object of compelling non-unionists to join trade unions. Taking all disputes of the year, only 6·6 per cent. of the workpeople directly involved were completely successful. The proportion who were altogether unsuccessful was 9·3 per cent.; while 84·1 per cent. effected compromises or were partially successful. As to coal mining, 25·9 per cent. of the workpeople directly involved in disputes commencing in 1911 were wholly successful, and 33·5 per cent. were unsuccessful; while 40·2 per cent. compromised or were partially successful, and 0·4 per cent. are returned as "indefinite."

LOCAL INCOME AND EXPENDITURE.

Finances of Urban District Councils.

The figures of the borough councils having been dealt with in a recent issue of the "Journal" [*ante*, p. 652], opportunity may now be taken to notice briefly the second portion of Part V. of the Annual Local Taxation Returns, which deals with the finances of Urban District Councils (other than town councils) for the year ending March 31, 1911.

The number of urban district councils in England and Wales, other than town councils, dealt with in the report is 811, which is a decrease of seven as compared with the previous year. The receipts of the councils, excluding receipts from loans, during the year 1910-11, amounted to £11,735,544; while for the preceding year the figure was £11,655,743. These receipts included sums received from county councils, as well as grants under the Agricultural Rates Act. The receipts from general district rates amounted to £5,455,785, and from other rates to £1,021,263. The other items on this side of the accounts include the following: Gas-works, £1,008,428 (compared with £1,011,098 the preceding year); water-works, £715,299 (against £711,840); and electric light undertakings, £401,349 (against £383,548). The financial statements show that the receipts in respect of gas-works included £751,105 from gas-rentals, and £224,374 from the sale of residual products. The receipts in respect of water-works included £505,304 from water rates, rents, or charges for domestic purposes within the districts of the councils owning the water-works, and £139,908 for water other than for domestic purposes. It will be noticed from these figures that a considerable portion of the transactions recorded relates to water, gas, and electric undertakings; and there are also, of course, other revenue yielding concerns—such as markets, tramways, and light railways. As a matter of fact, the total receipts from these different "reproductive" undertakings were sufficient to cover 96·2 per cent. of the expenditure on them (including charges in respect of loans). Many other financial transactions relate to works of private improvement, the cost of which is recovered by the councils from the owners or occupiers of property. The amount raised by public rates during the year under review accounted for 55·2 per cent. of the total receipts; while the receipts from the chief revenue producing undertakings, together with those relating to private improvement works, represented rather less than 24 per cent. of the total receipts.

The total expenditure of the urban district councils for the twelve months ending March 31, 1911, excluding that defrayed out of loans, was £11,591,816, as compared with £11,573,090 for the preceding year. Thus there was an increase on this side of the accounts of only £18,726. The following items of expenditure (in which charges for interest and repayment of loans are included) may be compared with the year 1909-10: Gas-works, £939,487 (as compared with £948,321); public lighting, £522,950 (against £521,569); water-works, £779,381 (against £788,931); electric lighting—excluding £107,975 for lighting by electricity included under public lighting—£409,329 (against £379,348). The loan charges—repayment of principal (otherwise than out of sinking funds and redemption funds), payments to sinking, &c., funds, and interest on loans—amounted to £3,063,985, compared with £3,103,931 in the preceding year. Of the principal and interest paid, and allocations to sinking funds, £248,543 was on account of gas-works, £385,834 of water-works, and £207,850 on electric light. The expenditure on main roads during the year was £528,425, or at the rate of £228 6s. per mile; and on other than main roads it was £1,057,832, or an average of £92 14s. per mile.

The expenditure of the urban district councils out of loans (including sums spent in anticipation of loans) within the period under review amounted to £2,042,125; and of this £124,363 was on gas-works, £177,238 on water-works, and £126,263 on electric lighting. The total expenditure out of loans during the year was less than in 1909-10 by £480,463; and substantial decreases occurred in all three items just referred to. The aggregate amount of the loans raised during the year was £2,112,345, including the following sums: Gas-works, £140,762; water-works, £153,295; electric lighting, £140,153. The amount of the loans raised was less than that of the previous year by £368,689. There is a large

decrease under the heading of water-works, and a more modest falling off for electric lighting. Gas-works, on the other hand, exhibit a trifling increase in the receipts from loans.

The amount that was actually repaid during the year in respect of loans (including payments out of sinking or redemption funds, but excluding unexpended balances of loans applied to the repayment of principal) was £1,761,080; and the outstanding loans at March 31, 1911, amounted to £35,543,565, as compared with £37,068,134 twelve months earlier. This large decrease of £1,524,569 is accounted for by the fact that the amount of debt transferred to municipal boroughs (owing to areas having been added to boroughs) in the account year was £1,845,583. Of the total outstanding debt, £3,294,870 was for gas-works purposes, £5,568,506 for water-works, £6453 for public lighting (other than public electric lighting), and £2,463,998 for electric lighting. Except in the case of public lighting, these amounts are slightly less than in the preceding year. The amount remaining at the end of the twelve months in sinking and redemption funds for meeting loans repayable in this way, was £600,433. The sum paid into the funds during the year was £214,382; and that taken out of them and applied to the repayment of principal was £195,236.

According to the preliminary report on the census of 1911, the total population of the 811 urban districts other than boroughs was 8,193,546. The total assessable value of these districts for the purposes of the general district rates, or other rates out of which the general expenses of the councils were defrayed, was £34,911,457. The rates raised by the councils (other than for purposes of elementary education) amounted to £5,622,284, which was equivalent to 3s. 2·6d. in the pound on the total assessable value of the districts for the purposes of such rates. This figure compares with 3s. 2·8d. in 1909-10.

It is remarked in the Blue-Book that in recent years there has been a distinct slackening in the rate of increase of the debt of the urban district councils. Whereas the outstanding loans of the councils at the end of the years 1901-2 and 1905-6 amounted respectively to £25,793,505 and £34,472,307, the amounts of the loans at the end of the years 1906-7 and 1910-11 were respectively £35,622,307 and £35,543,565. Thus it is seen that the total debt of the councils rose in the five years ended March 31, 1906, by £8,678,802, or 33·6 per cent., while in the five years to March 31, 1911, there was a decrease of £78,742, or 0·22 per cent. It is, however, pointed out that, in making these comparisons, it must be remembered that the figures are to some considerable extent affected by the continual changes being made in the number of councils by the forming of new bodies and the inclusion of others among boroughs. Glancing back over the past five years, it is noticed that the outstanding loans for gas-works have in this period decreased from £3,466,513 to £3,294,870; those for electric lighting have increased from £2,334,510 to £2,463,998; and those for water-works have gone up from £5,516,276 to £5,568,506.

CITY AND GUILDS OF LONDON EXAMINATIONS.

Coal-Tar Products—Structural Engineering—Heating and Ventilation.

In the "Journal" last week, we gave some particulars in regard to the results of the last examinations in "Gas Engineering" and "Gas Supply," extracted from the annual report on the work of the Technological Department of the City and Guilds of London Institute for the session 1911-12. As "Coal-Tar Products," "Structural Engineering," and "Heating and Ventilation" are taken up by many students of the two subjects which are immediately connected with the gas profession, we extract from the report the following details bearing upon them.

There are two centres in which instruction is given in the distillation of tar and the derivatives therefrom; and the classes were attended by nineteen students, of whom seventeen presented themselves for examinations and ten passed. In the first branch of the subject—tar distillation—two candidates passed first class in the Final Grade, two in each class in Grade I., and two failed in this grade. There were consequently six passes and two failures, or 25 per cent. In the branch that is devoted to coal-tar colouring matters, of the nine candidates examined, one passed in each class in the Final Grade and in Grade I., and five failed in the latter grade, or 55·5 per cent. of the total. The Examiners are Mr. W. H. Coleman and Dr. J. C. Cam; and in their report they state that the papers in Grade I. were, on the whole, well done, with the exception of the answers to two of the questions. They think a little more attention should be given to the calculation of yields, as well as to the appropriate dimensions of apparatus and its working. Both candidates in the Final Examination did excellently, especially in the practical portion of the paper. The Examiners say "the point which seems to require most attention is the training of the students to express briefly and clearly the knowledge they have." They emphasize the importance of this, not only, or chiefly, from an examination point of view, but because "the ability to express knowledge briefly and clearly, and yet completely and correctly, can only be possessed by those who have clear ideas of their subject."

"Structural Engineering" is taught at fifteen centres; the number of students last session being 521, of whom 261 presented themselves for examination, and 117 passed, as follows: Final Grade—first class, 3; second class, 25. Grade I.—first class, 30; second class, 59. The failures were 144, or 55·1 per cent. The Examiner is Professor W. E. Dalby; and his report is as follows:

Grade I.—Candidates, as a whole, are more acquainted with the applied mechanics of the subject than they are with the constructional details. Most of the sketches are very poor. Very few candidates were able to solve successfully the problem on the distribution of vertical stress at the base of a brick wall subjected to wind pressure. More attention should be given to the practical details of construction, as the subject is supposed to cover the practical part of the work as well as the mathematics of structures. Students should also be encouraged to make good sketches of details. These sketches should be made from the objects themselves, and should not be copies of other sketches. The ability to express clearly by sketches the details of structural work is of the highest importance.

Final Examination.—The criticism in Grade I., as to the preference of candidates for the mathematics of the subject rather than the practical details, applies to this grade also. Questions asking for design work are not well done. Very few candidates could clearly say what considerations determined the "factor of safety;" and specifications for materials were not at all satisfactory. More attention should be given to the structural part of the subject.

The subject of "Heating and Ventilation" is taught in three centres, at which 54 students attended. There were, however, 60 candidates for the examination; and 25 passed, as follows: Final Grade—first class, 2; second class, 3. Grade I.—first class, 6; second class, 14. The failures were 35, or 58·3 per cent. The Examiner in this subject is Mr. W. H. Atherton, whose report is as follows:

This year the question papers have been divided into two sections: (*a*) Relating to general principles and calculations; (*b*) relating to practical details and descriptive matter. Some of the questions were proposed by the President of the Institution of Heating and Ventilating Engineers.

There were a larger number of failures than last year, as it was necessary to show a fair knowledge of both sections in order to pass; and many candidates showed weakness on either the scientific or the practical side of the subject. Few were equally well prepared on both sides, though some good papers were worked. Much time was wasted by slovenly arithmetical work and the inability to use a slide-rule. Too many candidates also were unable to make neat sketches of the simplest details, such as pipe-fittings.

In Grade I. there was remarkable vagueness and inaccuracy as to the meaning of "absolute temperature." The different methods of measuring pressure were not well understood; and at least one candidate of fair general merit was hopelessly ignorant of the meaning of "absolute pressure." The elementary education of a few candidates leaves much to be desired. Singularly few candidates appeared to have any knowledge of the hot-air system of heating a church; while the questions relating to fans were seldom attempted successfully.

LEWES ON THE CARBONIZATION OF COAL.*

In this work, by Professor Vivian B. Lewes, we have a "scientific review of the formation, composition, and destructive distillation of coal for gas, coke, and bye-products;" and it will be readily admitted that there is no one more competent than the author to deal with the subject.

Professor Lewes has taken the Cantor lectures which he delivered a year ago at the Royal Society of Arts as a basis for a short treatise on the subject. Readers of the "Journal" will not need to be told that this series of lectures created widespread interest throughout carbonizing circles. It is well, therefore, that the subject should be re-introduced on a more detailed scale. Any information calculated to increase our knowledge of this wide subject spells a larger measure of prosperity for the gas industry. For this reason the author's work is welcomed, and will doubtless find its place on the bookshelf of up-to-date gas engineers.

While we cannot pretend to be in agreement with the author on the subject of low temperature carbonization, it is just as well that its cause should be pleaded by so experienced a counsel as the author. He makes the most of it; and while the production of a coke containing a good percentage of volatile matter would undoubtedly be more suitable for the domestic grate than the highly carbonized coke we supply to-day, we really cannot agree that the change to such a procedure would be profitable to the gas maker. The allied advantage of an improved tar resulting from such a process would assist but little to compensate for the enormous quantity of gas left in the half-carbonized coke.

Professor Lewes outlines an ideal system, in which the coal as charged into a vertical retort is first exposed to intense radiant heat, which is gradually reduced as the coal works its way down the retort. The passage through the retort would be so regulated that the coke on being discharged would contain "enough volatile matter to make a good domestic fuel." The loss of gas resulting from such a system would be counteracted by introducing about 40 per cent. of blue water gas, which would be heated by the outgoing coke prior to its introduction. It comes to this then, that the price of obtaining a better coke for domestic grates would be the cost of making the water gas to replace the gas not extracted.

* "The Carbonization of Coal. A Scientific Review of the Formation, Composition, and Destructive Distillation of Coal for Gas, Coke, and Bye-Products." By Vivian Byam Lewes, F.I.C., F.C.S., &c. London: John Allan and Co. [7s. 6d. net.]

Thus, the expense on the manufacture of the water gas required for such a process must be met by a willing public.

The author suggests—and he has good grounds for his suggestion—that the addition of water gas to the retort during the process of carbonization has many analagous advantages which would have to be placed on the "credit" side of the balance-sheet. The subject is a highly interesting one; but anything like a full criticism of Professor Lewes's suggestion would be a digression in a review, so the subject must be left for readers to pursue according to their own inclinations.

The author divides his subject into ten chapters and an appendix, containing in all 315 pages. Illustrations numbering 27 are also included. Chapter I. treats of the "Formation and Composition of Coal" followed by the "Classification and Distribution of Coal" in Chapter II. We have next a description of the vertical retort systems, where special attention is paid to the continuous processes. No mention, however, is made of the types designed by Herring, Wilson, and Dempster. The author is an ardent admirer of continuous carbonization; but, like many others, he does not consider that horizontals, when worked with full charges, should be discarded until scrapping is necessary. On the other hand, there are a great many engineers who do not consider that a vertical retort system should be adopted so long as the capital expenditure is maintained at a figure approximating to double that entailed in the construction of horizontal settings. Again, there are some who doubt that better results can be obtained in respect of yield of gas, coke, tar, and ammonia in a setting of verticals as compared with a modern installation of horizontals; and there are good grounds for such doubts. All agree that there is a substantial saving in labour, and that gas making is carried on with a minimum of dust, smoke, and steam. But is this sufficient to warrant double expenditure on the initial outlay of plant?

Chapter IV. gives some details of "Coke-Ovens and their Development." This is followed by a most interesting chapter on "The Conditions Existing in the Destructive Distillation of Coal," in which the author is at his very best—and this is saying a great deal. He gives a number of figures which show how far we are from obtaining for useful work the full heat from the coke we burn in our retort-furnaces; and yet we burn no more than 20 per cent. of the coke we make, or 13 lbs. of coke per ton of coal carbonized. The figures referred to show the immense scope that exists for further improvement in fuel consumption. The transmission of heat through the walls of a retort and the penetration of heat into the charge of coal are explained in a convincing manner. The passage of gas through a "full" charge of coal is another matter that is discussed in the author's own inimitable style.

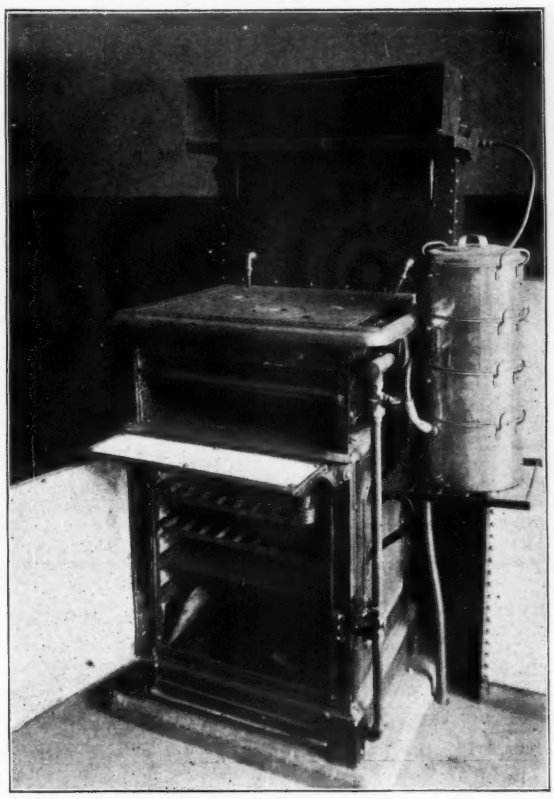
The primary gaseous products resulting from the distillation of wood, peat, lignite, and coal receive adequate treatment in Chapter VI. One of the features of the book is the chapter on "Tar: Its Formation, Use, and Decomposition." The author deals with this question in a way that is calculated to much increase our stock of knowledge on the subject. Its limitations for gas-making purposes are clearly explained. A chapter on "Coke" follows, wherein is shown the author's strong predilection for a low-temperature coke—a point which has already been mentioned. It is a very curious coincidence that ever since the hard, highly-carbonized coke, resulting from heavy charges, has been put on the market, the prices for this bye-product have been higher than during the years preceding the change. This, again, has happened in spite of the fact that of late years more coke has been put on the market as a direct result of the increased use of regenerative furnaces.

Chapter IX., on the "Nitrogen and Sulphur of Coal and their Recovery," and Chapter X., on "Modern Coal Gas," are both treated in an interesting manner, and form a fitting conclusion to a thoroughly useful addition to a carbonizing engineer's library.

A COMBINED COOKER AND WATER-HEATER.

With the idea of providing a supply of hot water automatically when using a gas-cooking stove, Mrs. C. E. Wills, of St. Cleer, Southport, has patented a combined cooker and water-heater, for which a number of advantages are claimed; and Miss Hester Ashton, the Head Cookery Teacher at the local Science and Art Schools, as the result of a test of the Wills stove against an ordinary cooker, reports that she has found the consumption of gas, for the same work, just about half as much with the former as with the latter, while there were other points also in favour of the Wills patent.

In the first place, the stove is provided with a closed-in hot-plate, with suitable provision for the supply of air to the burners; while under the hot-plate, and above the oven, there is a plate and dish warmer. The different burners are surrounded by coils of pipe, connected with a tank at the back of the cooker, which holds several gallons of water. A gauge is fitted for indicating the amount of water in the tank; and there is a draw-off tap at the side. There is another coil of pipes, connected with the tank, round the top of the oven; the intention, of course, being that the heat employed in the stove for cooking should at the same time be utilized for water-heating. The products from the oven and the enclosed hot-plate are carried to the back of the stove, and pass through the water in the tank (by means of tubes) to another plate-rack above the tank. Even when the oven-jets are not lighted, the oven is more or less heated (thereby providing further warming accommodation) by the circulation of the hot water from the tank through the coil of piping at the top. When water is boiling in the tank, the steam can be carried through the steam-pipe shown at the side, and used in a four-compartment steamer.



The Wills Patent Combined Cooker and Water-Heater.

Under a separate patent, deflectors are fitted over each row of jets in the oven. These deflectors are hinged, and so arranged that they can be manipulated to direct the heat from the jets to any particular portion of the oven that may be desired.

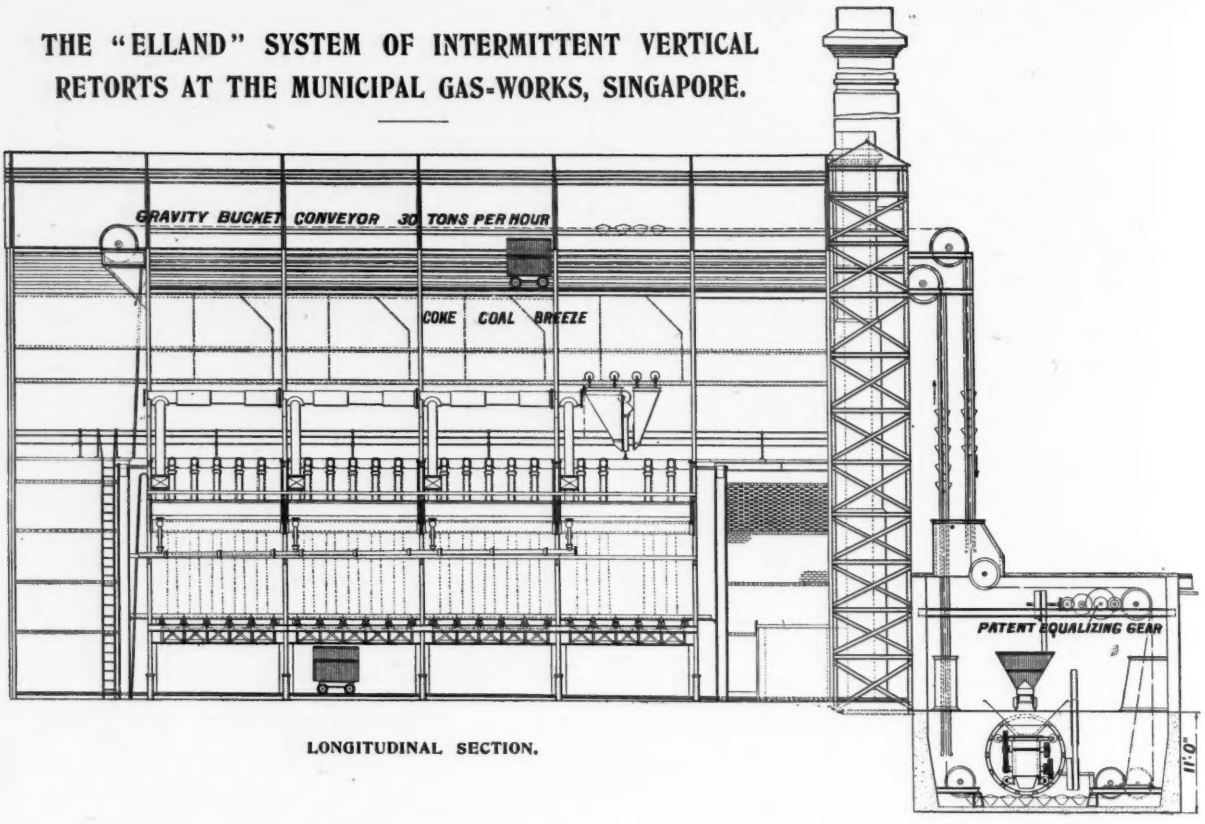
The saving of gas experienced by Miss Ashton when using the patent cooker has already been referred to; and the numerous other advantages claimed by Mrs. Wills for the invention must be reproduced in her own words, inasmuch as it is not possible to speak here of the stove from actual experience of its working. The advantages are set forth as follows: The top being covered in, half a dozen pans can be kept boiling with one burner. No cold plates—all dishes kept warm in patent hot chamber. Special arrangement inside oven will concentrate heat on any given part—*e.g.*, one-half of the oven can be roasting, the other half at the same time cooking a pudding or custard. Hot water always to hand without extra gas. The special tank keeps the water hot enough to wash dishes, after the gas has been turned off for five hours. A shelf for keeping vegetable dishes warm, with covered top. No fumes escape on the patent stove, nor is there the least smell. It is simpler and easier to work while cooking. No gas can possibly be wasted on the patent stove. No possibility of burning food. Much cooler when in use than any existing cooker. Waste steam can be utilized for cooking. All foods remain hot for any reasonable length of time, without spoiling or drying. It is much more easily cleaned, and cooking utensils last longer, because they are never dirty. No bars. It can be fixed without a flue, because there are no fumes to carry away.

A stove on behalf of which so many claims as this are advanced can fairly appeal for careful consideration at the hands of both suppliers and users of gas.

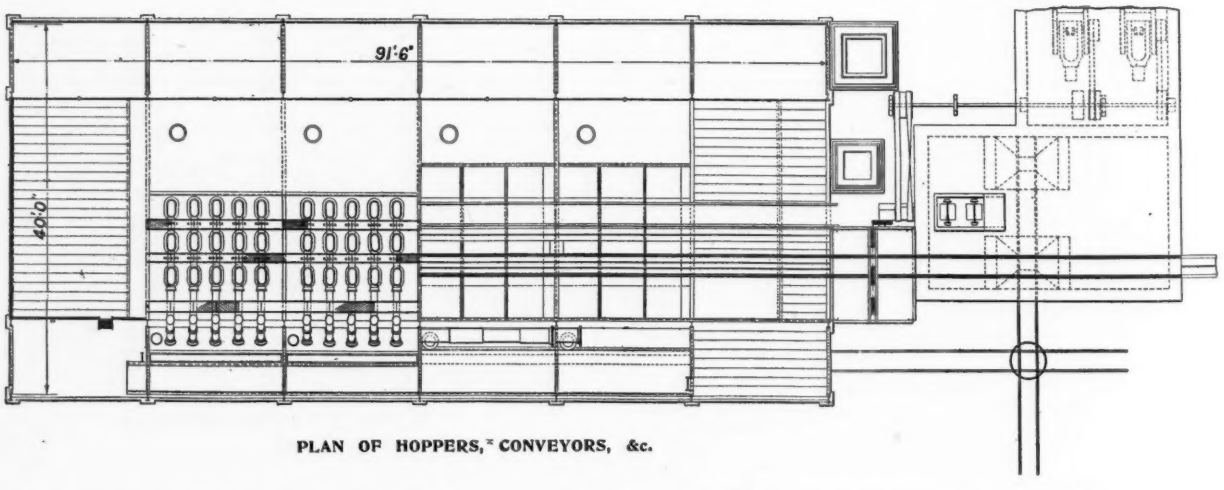
Among the lectures announced for delivery at the Royal Institution before Easter are two by Professor Bertram Hopkinson, F.R.S., on "Recent Research on the Gas-Engine;" and two by Mr. W. B. Hardy on "Surface Energy."

Among the new pumping plant now being put down by the Metropolitan Water Board is an additional installation of Diesel engines at the Cricklewood pumping-station. It consists of three units, each comprising a four-cylinder vertical engine developing 200 B.H.P. at 250 revolutions per minute, and driving a horizontal three-throw ram pump by means of helical gear with a reduction of four to one. Each unit is capable of lifting 2 million gallons of water a day to a height of 250 feet when running at 240 revolutions per minute. The water will be derived from the Cricklewood service reservoir, which has a top-water level of 138 feet above Ordnance datum.

THE "ELLAND" SYSTEM OF INTERMITTENT VERTICAL RETORTS AT THE MUNICIPAL GAS-WORKS, SINGAPORE.



LONGITUDINAL SECTION.



PLAN OF HOPPERS, CONVEYORS, &c.

We are able to-day to illustrate an installation of intermittent vertical retorts which has been ordered for the Far East; and in connection with this, it may be explained that Mr. J. P. Hallaway, the Engineer to the Gas Commissioners of Singapore, recently studied and examined all the newer forms of carbonization in this country, and received designs and tenders for the types favoured. As the result, Messrs. Robert Dempster and Sons, Limited, of Elland, have received an order to the value of nearly £23,000 to install their "Elland" system of intermittent vertical retorts, complete with coke gantries, hoppers, and foundations, at the Singapore Gas-Works.

In recent discussion among gas engineers, it has been recognized that, while vertical retorts, whether of the continuous or the intermittent type, are approximately equal in productive capacities for gas and residuals, both systems have advantages and disadvantages in relation one to the other. For example, the continuous system, it has been pointed out, depends on machinery 24 hours per diem, but all quenching of hot coke is saved; while the intermittent system depends on machinery only eight hours per diem, but all hot coke needs quenching. Hence, the factors which generally must decide the choice of plant are the financial and the local conditions. The representative types of both the continuous and intermittent systems are, in certain fundamental details, remarkably similar.

The chief characteristics claimed for the "Elland" system, apart from important details and arrangement of construction, are the patent stoking appliances, by means of which a specially lightly laid or porous charge is placed in the retort, and the free space over the charge is always automatically maintained. By reason of this, the charge shrinks more from the walls of the retort, thereby giving readier escape of the gas and readier discharge of the coke, which will be less dense in formation.

The installation illustrated above has been arranged to suit special requirements and conditions peculiar to the gas-works at Singapore. It has been designed to produce 1,000,000 cubic feet per diem

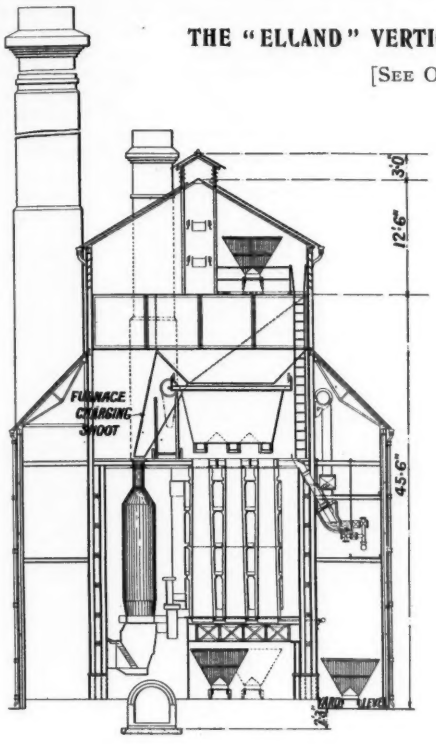
The retort-bench contains three beds of fifteen retorts, and one bed of twin sixes, so arranged that it can be reset when required as a bed of fifteen, without further alteration to ironwork, regenerator, or furnace. The retorts are set in triple rows; but the single-pull lids (Toogood's patent No. 20,851 of 1908) are so arranged that each retort can be discharged separately and independently by hand power alone, thereby coupling the merits of the two-row method of setting to the economies of the three-row method, and, incidentally, rendering the plant more free from dependence on machinery.

The hot coke is discharged direct into ball-bearing side-discharging trucks, which are run with the greatest ease down the incline to the quenchers. Three quenchers are provided, so that the trucks are speedily dealt with, and the steam exhausted without nuisance by a chimney rising to a considerable height above the retort-house roof.

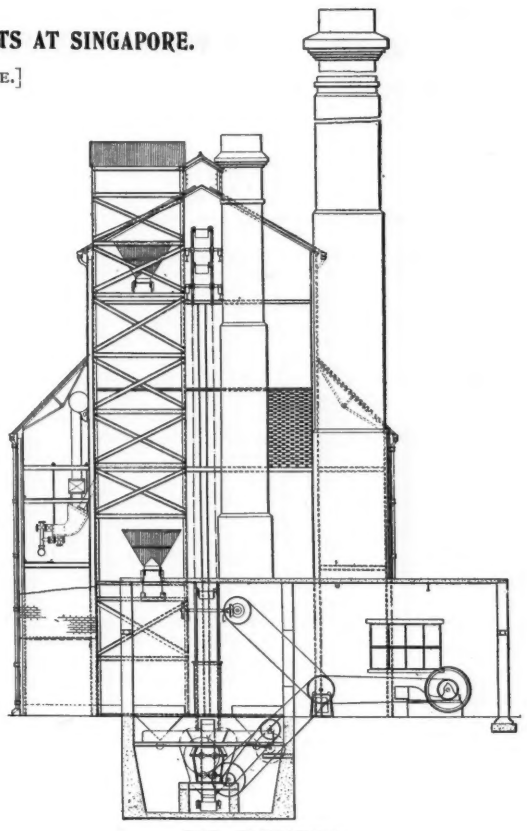
The storage hoppers are of 24 hours' capacity for coal, coke, and breeze, and are arranged in one line, so that they can be efficiently trimmed with coal, coke, and breeze either by the conveyor or by trucks, by means of the hoist. The hoist will handle 30 cwt. at 80 feet per minute, and normally is required for coke handling, but can be used to give access to the bench and hopper top, also to trim coal, coke, and breeze to the storage-hoppers, and

THE "ELLAND" VERTICAL RETORTS AT SINGAPORE.

[See Opposite Page.]



CROSS SECTION.



END ELEVATION.

also coke to and from the high-level and low-level yard gantries to screens and hoppers not shown in the illustration.

The coal-handling plant consists of a twin receiving hopper and twin feed, a four-roll breaker, rotary filler, breaker bye-pass shoots, and gravity bucket conveyor, capable of handling 30 tons of coal per hour, and arranged so as to be able to handle coal, coke, and breeze to the several compartments of the hoppers, and also so that the breaker can be thrown idle, and the conveyor deal direct with nut coal—each bucket being apportioned its load by means of the automatic reciprocating feeds and the rotary filler.

The plant is so grouped that all can be driven by one gas-engine, without the intervention of any long line shafting or other means. A spare gas-engine is provided for emergencies.

All driving gear and appurtenances being grouped at one end of the house, future extensions can be added at the opposite end, to facilitate which the main buckstays for future extensions form the principal uprights of the gable end structure.

The details of the "Elland" system were illustrated in the "Journal" on June 4 last, pp. 637-41.

GAS SUPPLY OF ST. PETERSBURG.

[Communicated.]

The St. Petersburg Gas-Works, which have for some years been a municipal concern, have issued their balance sheet for the year 1911, showing a gross revenue of 1,324,170 roubles against an expenditure of 967,800 roubles—a balance of 356,369 roubles to the good. Most of the receipts were, of course, for gas making—946,636 roubles. The quantity of gas used for house lighting was 194,178,900 cubic feet (of a value of 526,632 roubles); for motors, 34,219,900 cubic feet (value 69,300 roubles); and for technical purposes, 42,485,060 cubic feet (value 100,398 roubles); for street lighting, 156,819,210 cubic feet (value 249,624 roubles). The total quantity produced was 427,703,070 cubic feet, valued as above. The price charged by the city for gas was 0·22 copeck per cubic foot; private lighting gas was charged at 0·27 copeck; gas for technical purposes, 0·22 copeck; for power, 0·20 copeck; and the same for street lighting. This gas was produced from two works in the town, and the bye-products made included 2,200,000 poods of coke, 137,100 poods of tar, besides ammoniacal water, retort carbon, &c.

The St. Petersburg Gas-Works, which are obviously a successful enterprise of the town, were taken over from the private Company some years ago in a deplorable condition, because the Company owning the property that was about to be transferred, allowed everything to go to wreck except what was absolutely essential to keep the works, so to speak, on their feet until the date of transfer. As the transfer occurred when Russian finances, including municipal affairs, were in a somewhat unsettled state after the war, a good deal of international rivalry took place to obtain, if possible, the concession for running the St. Petersburg Gas-Works, and to obviate their becoming public property. The Germans were keen competitors and offered, on apparently favourable terms, to suppress the ordinary coal gas supply and introduce an attractive water-gas system. English contractors, too, did their best to obtain the concession; and at one period an English enterprise, not so strong now as it was then—entitled "Coalite"—had the advantage of an announcement in "The Times" newspaper, that it had succeeded in obtaining control of the St. Petersburg gas supply. But it turned out that the announcement was simply an amplification of some understanding that had been come to of a preliminary nature, which by no means amounted to a contract of the kind indicated in the public announcement made. In the end, the St. Petersburg authorities, for what reasons need not be sought, ceased listening to the blandishments of the foreign contractors, and set to work to restore the gas-works which they had received in such a dilapidated condition. The result has been continuous prosperity since that time.

Gas making in Russia is not a promising business. There are very few gas-works in the whole empire. The reason, of course, is that when the Russian municipalities became public-spirited enough to think of adopting comprehensive lighting systems, electricity was already an established institution for the purpose the world over. Therefore, as Russia was not particularly rich in coal, and had often to buy her requirements from abroad, it was generally electricity that she chose for her lighting. Consequently, there are hundreds of towns now in the country lighted by electricity, a large proportion of which are under the immediate control of the respective municipalities, while the number of gas-works may be spoken of in tens rather than hundreds. One of the most important of the latter is in Warsaw, and this comes into prominence because it has shown Russia the way to turn her bye-products into gain. It is probably the pioneer gas-works in the country for the recovery of ammoniacal liquor, and the resulting sulphate of ammonia.

So long, therefore, as England is a large coal exporting country, it is quite probable that the gas-works on the Baltic and the Gulf of Finland may remain busy concerns, for it is a very cheap business to transfer the coal from Leith or Newcastle to St. Petersburg (say) or Riga. The raw material is more easily conveyed to St. Petersburg from Leith than it is from any of the Russian coal-fields, the coal from which would have to make a long railroad journey before arriving at the Russian capital. The principal competitor here threatens to be electricity, generated by the Finnish waterfalls. Many schemes are on foot for supplying St. Petersburg with electricity from Finland. Most of these are foreign enterprises, and one of them consists in the utilization of several waterfalls in the Vuoksa Valley which have just been bought by some Belgian bankers for about £500,000. If these plans materialize, the gas-works would have a powerful competitor, at all events as far as lighting is concerned. But there is still a wide field in the form of internal combustion engines and heating and cooking in domestic circles to fall back on. And in

St. Petersburg, as elsewhere in Europe, the gas-works authorities have learnt that this is a good branch to develop; for, as can be seen from the prices that have already been quoted, the lowest rate for gas in St. Petersburg is granted for power.

VERTICAL RETORTS AND CONTINUOUS CARBONIZATION.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

When systems of carbonization are being discussed, the expression "vertical retort" may be, and sometimes is, considered to include not only strictly upright vessels, but anything sufficiently inclined from the horizontal to admit of the charge falling in by force of gravity without other assistance, and of the spent residue falling out when required by the same agency, without help other than that of a tickling bar. It may therefore include anything down to 35° from the horizontal. But there is this important difference—that directly we get away from the vertical to the inclined, from a retort having its central axis strictly parallel to a plumb line, to one in which the central axis is anything less than a right angle, we approximate to the conditions of high side and low side, with probably a clear space on the high side, as they are to be found in the horizontal retort. In the vertical retort, the charge at any one horizontal section will be under equal compression throughout; but in other forms there will be less compression, and probably a clear space on the high side. In this respect, there is a fundamental difference between the vertical and other forms of retort that must have an important effect on the conditions of carbonization. The following remarks apply to strictly vertical or perpendicular retorts.

There is similar looseness with regard to continuous charging, because there is no system in use in which the coal flows in a continuous and unbroken stream into the retort. It is a convenient expression for indicating short-period or small-weight charging in contradistinction to the plan of filling the retort at one operation, and with the greatest rapidity practicable, sometimes called the intermittent system. This system presents so many practical conveniences that it is retained to some extent in all forms or positions of the retort. The references to continuous charging in this paper are directed to charging by the spoonful in distinction to charging from the scoop.

As having some personal knowledge of what I believe to be pioneer work in the way of bringing vertical retorts and continuous charging into the range of practical working, I have followed with much interest the references to these methods at recent meetings of the Institution of Gas Engineers and the Midland Association of Gas Managers, in Dr. Davidson's various communications on the subject and in the recent discussion thereon. The vertical retort, it is true, is not new. From the days of Murdoch, various desultory endeavours have been made in the way of utilizing it; and there has been some dim and indistinct notion that it really possesses special advantages. But it was not till the publication of the Settle-Padfield researches at Exeter that there was any clear idea of the practical feasibility of vertical retorts and continuous carbonization—to say nothing about their superiority to the ordinary methods in a gas-yielding sense. And perhaps it should here be mentioned that, though the Settle-Padfield retort was curved or inclined at the base, for convenience of extracting the spent charge, it was to all intents and purposes a strictly vertical retort. All the work was done in the vertical part, and the incline at the base simply held a reserve of practically exhausted coke.

In 1903, my attention was directed to some remarkable results being obtained at Exeter by Mr. T. Settle (who, in my opinion, has not received the credit to which he is entitled for the amount of spade-work that he accomplished), demonstrating for the first time not only that vertical retorts and continuous distillation were practicable, but also that they opened up a most promising and interesting field of research. The apparatus at Exeter was not merely a laboratory test, but a small-scale working experiment with a single retort capable of dealing with 2 cwt. of coal or more at one time. Full details were given and illustrated in the "Journal," Vol. LXXXII. p. 881. Mr. Padfield requested me to verify these results as an independent expert, and to prepare a report for publication. After several days of very interesting association with Messrs. Settle and Padfield at Exeter, this was accordingly done—see "Journal" as above, and also Vol. LXXXIII., p. 235. Altogether I made some forty independent workings, subject to my own conditions and arrangements for checking the accuracy of the results; and nothing was published that was not substantiated and proved by examination of the gas in respect to specific gravity and composition, a balance-sheet of weights, &c. Special attention was given to the soundness of the retort, and to the maintenance of a level gauge and absence of exhaust on the outlet. The special points to be verified were the yield and quality of gas and coke; but incidentally in the course of the investigation a large amount of information was unearthed that was not published. The plant was also examined and reported upon by Professor Vivian Lewes, and other known authorities; and the reports all agreed that a better yield and quality of gas was obtained than could be secured by the usual methods of intermittent charging in horizontal retorts from the same kinds of coal, and that the coke was heavier in yield and harder in quality.

Mr. Settle explained his views on the occasion of my first visit to Exeter, and fully supported them by chapter and verse from a bulky collection of tests. I have not yet seen any reason to doubt their correctness. He maintained that the charge in a horizontal retort must of necessity be subjected to unequal conditions of temperature. The parts in contact with the hot retort quickly acquired a high temperature; but some time elapsed, during which a large quantity of incompletely decomposed volatile products left the retort, before the whole charge had acquired the full temperature. The heavy metal mouthpiece and accessories at the front end render the front 2 feet run or so of the retort appreciably cooler than the back end. As the result of these two causes, a considerable quantity of the volatile products passed off and escaped at a temperature too low to yield permanent gas; while portions from the back end, especially late on in the charge, were overheated and passed over, or in contact with, more heated surface than was good for their health, or even for their existence. Both as regards longitudinal and transverse sections, this diversity of conditions is unavoidable with the horizontal system of working. Coal on the front part of the retort has a direct cut to the hydraulic; while the volatile matter from the back end must filter through a quantity of partially decomposed coal, or traverse 6 or 8 feet run of radiant surface above it. He also claimed that tar was not a necessary or unavoidable product, but was simply the result of the distillation of coal in parts at too low a temperature. In his experimental retort, however, every particle of coal, and every cubic inch of products were subject, with slight variation, to equal conditions of heat and travel. Therefore his system must of necessity give better yields or better values than the horizontal. Claims have been advanced to the effect that the Exeter results can be equalled on the usual plan of working; but I have never seen any rational explanation in support of them, or in contradiction of Mr. Settle's views as above mentioned.

Some confusion was imported into the Midland discussion by the fact that there is not unanimity as to the definition of good carbonization. We can well understand that the ideas of the manager of a set of coke-ovens or oil-stills would not coincide on this point with those of a gas-works manager. The early endeavours of those who sought to improve methods of carbonization were exclusively directed to the yield of gas. Other products were of little or no commercial value, and if they were reduced it was advantageous rather than otherwise. Later it was understood that the yield of gas meant something more than cubic feet, and we began to talk about candle-feet per ton, or total B.Th.U. per ton. Residual products were no longer waste, or even cheap, but gas still retained the lead as a primary product. So far there was entire unanimity, and it was easy to assess the value of a new process. But now the acme of carbonization is a variable quantity depending on locality. Coke, tar, and ammonia have gradually caught up in the running, and the position of gas as a primary product is threatened. In place of one definite aim and object for all alike, one now wants one thing, a second another, and a third something else. The question of the highest value as applied, not to one, but to the total of all the products, brings in different circumstances according to size and other local conditions—such as the demand for coke, or the cost of carriage to the nearest tar-works. A system that takes the top seat at Birmingham may be very middling at Manchester, and go to the bottom of the class in London.

As long as the laws and conditions of gas supply remain unaltered, gas must of necessity be the primary product, and the doctrine of highest values must be subject to considerable modification as not being always practical or in the end the most profitable. It is easy to conceive of cases where the highest value and the largest profit are not one and the same thing. Perhaps 99 engineers out of 100 would not be comforted on going to the works one morning in this dark wintry weather and finding that the yield of gas was 10 per cent. less, but in place of it there was 10 per cent. more tar, which would bring them in an additional 2d. a ton. The old-fashioned method will always find a good following. Gas companies are for the most part under penalty in regard both to quality and quantity of their gas supply; and on account of the physical properties of gas it is scarcely practical to store more than 24 hours' supply. If it could be stocked weeks or months ahead, like coke, the position would be different. A company cannot be summoned before the magistrates for refusing or being unable to supply coke, tar, or ammonia.

Dr. Davidson thinks that too much is made of the yield of gas per ton, and that less gas and more tar is the more profitable. This may be the case at Birmingham and a few other places that are on the top of the collieries and next door to a tar distillery, with the result that they are near the bottom of the list in respect to the price of coal delivered on the works, and near the top as regards the price of tar. But many gas-works are 100 miles or more from the colliery, 50 miles from the nearest tar-works, and perhaps have no railway siding—conditions which largely increase the cost of gas, and at the same time reduce the price (that is, the net price after paying carriage and loading expenses) of tar. This is the position of many of the gas-works in the South of England, and hence continual endeavours to improve the yield of gas, even at the expense of the other residuals. The late Colonel Makins once alluded to tar as the *bête noire* of a gas company; and though prices have improved since that time, the remark still holds good in many instances.

Dr. Davidson also appears to hold the opinion that a high yield of tar is evidence of good working in other respects. It is surprising that modern vertical retorts, so far from following the

lead of the Exeter experiments, give an increased yield of tar to the extent of 30 per cent., as compared with ordinary working; but I would venture to suggest that a full tar-well means a lean gas—a gas low in hydrocarbons and high in carbon oxides. When we contemplate diluting gas by the introduction of steam or furnace gases in the retort, or by blue water gas, it is important to have a fat gas rather than a lean one to begin with—a gas high in hydrocarbons and low in carbon oxides. The same applies to mixtures with carburetted water gas, especially if limitations should be imposed as to the percentage of carbonic oxide.

Then Dr. Davidson also seems to regard tar as an unavoidable accompaniment to destructive distillation, and doubts whether anyone has succeeded in gasifying it. With the Settle-Padfield retort at Exeter, there was no difficulty in reducing the tar to the vanishing point. The usual yield with that process was 4 to 6 gallons per ton, or one-half the usual gas-works yield; and in this respect there was agreement with the Dinsmore process, which was in practical operation for some years at Widnes. Coal is very cheap at Widnes, so possibly it now pays to follow Dr. Davidson's lead and get a good yield of tar. The results of some experiments at Exeter appeared in the "JOURNAL" (Vol. LXXXIII., p. 235), and show that when the 4 to 6 gallons were entirely decomposed there was the advantage of a gain of 30 lbs. of coke and 650 to 1200 cubic feet of gas per ton of coal carbonized. The researches of the late Mr. William Young, which led to the introduction of the Peebles process, went to prove that tar in common with other fluid hydrocarbons can be entirely converted into permanent gas and solid carbon.

Comparing the Exeter results in 1903 with those published within the last two years, there is remarkable agreement in some respects, and equally remarkable divergency in others. Some doubts were expressed in regard to the accuracy of the earlier results—as to whether they were *bonâ fide*, or assisted by well-known dodges that are more ingenious than honest, such as the introduction of steam or overpulling. But it was the object of all concerned, as I am sure it is of subsequent workers, to get at actual facts rather than phenomenal, and to some extent fictitious or illusive, results. It is interesting to notice first, the agreement between the Exeter results in 1903, those quoted by Mr. J. Ferguson Bell a few weeks ago, in the matter of make and candle power, and some reports by independent authorities on the working of the Woodall-Duckham system, kindly supplied to me, through the courtesy of Mr. Harold W. Woodall, by the Woodall-Duckham Vertical Retort and Oven Construction Company.

Exeter. ("JOURNAL," *Vol.* LXXXIII., *p.* 235).

Settle-Padfield, 12,710 cubic feet per ton, 13·7 c.p.

Mr. J. Ferguson Bell. ("JOURNAL," *Nov.* 5, 1912).

Average of 5 tests, Woodall-Duckham, 12,450 cubic feet per ton, 15·5 c.p.
" 17 " Glover-West, 12,576 cubic feet per ton, 15·5 c.p.

Average of four months' practical working at Luton, Woodall-Duckham, 12,800 cubic feet per ton, 16·4-candle power.
Official test at Lausanne, Woodall-Duckham, 12,492 cubic feet per ton. Specific gravity of gas, 0·469.

The illuminating power tests at Exeter were taken with a No. 1 "London" argand burner; but the No. 2 "Metropolitan" is now generally used, and the probability is that the later tests were taken with it. The difference between the two burners is 2 or 2½ candles; and allowing for this difference, the Exeter results are slightly better by the photometer, as they are by the meter. But there are remarkable differences as to composition of gas and yield of tar. The Exeter experiments indicated that a fatter gas could be obtained from the vertical retort than from the horizontal. The modern tests show a leaner gas. Pitch was an unknown quantity at Exeter. Now it is so troublesome that pitch-pans and other special arrangements are required.

Before proceeding further, one or two points bearing on the subject may be considered. Mr. Duckham refers to the advantage of a free space above the charge. There are many factors included in this matter. The sectional area and length of the space, compared with the rate of production of gas, will indicate the length of travel and the time of exposure experienced by each individual particle of volatile matter during its journey from the point of generation to the outlet of the retort. The temperature at that part must also be considered, as it may be designedly hotter or colder than other parts. The weight of the charge or the quantity carbonized per hour has an important effect. In a retort working off 2 cwt. per hour, the rate of travel will be one-half, and the time exposure double, as compared with the same retort working off 4 cwt. per hour. It would appear from recent experiences that the rate of travel and the time exposure are even more important, in regard to the extent of the secondary decomposition and the ultimate composition of the products, than the degree of temperature in the free space; and this applies irrespective of the shape or of the angle of the retort. Many engineers testify that, by working heavier charges and higher temperatures in the horizontal retort, they get a higher candle foot or B.Th.U. value per ton; and yet the gas, as it makes it way to the ascension-pipe, is exposed to a higher temperature and a larger extent of contact with incandescent surface. But if the charge is double, it is obvious that twice as much gas must travel over a smaller area in a given time, and therefore the rate of travel will be more than doubled, and, conversely, the time exposure will be proportionately decreased.

In 1903, the full retort and heavy charge was in its infancy, and the general opinion was in favour of a free space above the coal, as likely to increase the yield of gas, perhaps at the expense of the tar. This meant comparatively slow travel and a long time period of exposure. Passage through red-hot coke was considered to be detrimental. The 22 in. by 16 in. ⌂ section retort was regarded as an improvement on the 22 in. by 14 in., not because it would take a heavier charge, but because it left a larger free space. Judging by later experience, it would appear that the more rapid rate of travel was sufficient to more than compensate for any prejudicial effect due to exposure to higher temperature and a larger extent of surface.

In the Exeter experiments, the section of free space above the charge was subject to periodic variation because, although the charging was continuous, the withdrawals of coke were intermittent. Mr. Settle considered that the best results were obtained with the retort two-thirds full, which meant a 3 feet clear space above the charge. He also designedly applied the highest temperature at the lower part of the retort, and arranged his furnace and flues in such manner as to leave the upper part of the retort at an appreciably lower temperature. Otherwise the mouthpiece and charging plunger would be overheated. Under such circumstances, there is a great difference between the effect on the composition of the products, as compared with a retort at a full equal heat throughout, or perhaps hotter in the upper part. I do not remember the exact rate per hour at which coal was carbonized, but it would be less than in the modern methods. The retort was 9 feet long, and contained 6 feet depth of charge; whereas the latest systems favour charges three or four times this depth. We may say that in the Settle-Padfield retort the gas was exposed to a lower temperature, but a longer time limit. One result was an appreciably less deposit of carbon in the retort than is the usual experience. In some of the modern systems, it would seem that the deposit is more rapid. Under any system of working, a rapid furring-up of the retort usually means trouble from pitch in the ascension pipes and hydraulic.

Dr. Colman mentions a method of valuing the gas yield by taking out each constituent in cubic feet per ton. This is an excellent plan, providing a representative average sample of the bulk is available. I have used it for the last thirty years; and as applied to the Exeter experiments, it illustrates the point above mentioned—that they yielded a remarkably fat gas, while later methods move in the other direction. In the table below I have taken out the number of cubic feet of hydrogen, methane, hydrocarbons, and carbon oxides, as obtained by the Settle-Padfield, Glover-West, and Dessau processes. And by way of further illustration of the remarks on gasifying tar, I have added the figures of the Dinsmore process as given in the report of the late Professor Foster.

I put down the report of the discussion at the Midland Association with a feeling of disappointment, because I had hoped to find some explanation of the divergencies above noticed.

—	I. Hydrogen.		II. Methane.		III. Hydrocarbons.		IV. Carbon Oxides.		II. and III. Total Hydrocarbons.	
	Per Cent.	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent.	Cubic Feet.		
Settle-Padfield (Lewes) . . .	34·6	4584·5	56·17	7442·5	5 06	670·5	4·17	552·5	61·23	8113·0
Glover-West (Colman) . . .	53·3	6703·0	28·0	3521·5	2·3	289·0	15·1	1899·0	30·3	3810·5
Dessau 542 (Nelson)	50 2	7001·5	29·0	4041·0	3·3	460·5	11·8	1666·5	32 3	4501·5
" 1248 (Davidson) . . .	51·0	7240·0	28·0	3975·0	2·8	397·5	12·7	1803·0	30·8	4372·5
" 12 59 (Bell)	49·3	6152·5	31·2	3894·0	3·9	486·5	10·4	1298·0	35·1	4380·5
Glover-West (Newbigging) . .	57·1	6888·5	30·4	3666·0	3·6	434·0	7·1	856·0	34·0	4100·0
Dinsmore (Foster).	50·6	5970·0	33·4	3941·0	4·37	515·6	10·53	1242·5	37·8	4456·0

Physical Society's Annual Exhibition.—This exhibition, which, as already announced, is to be held next Tuesday, at the Imperial College of Science, South Kensington, will be open, as in previous years, in the afternoon from 3 to 6 p.m., and in the evening from 7 to 10 p.m. Some thirty firms will be exhibiting. We understand invitations have been given to the Institutions of Electrical and Mechanical Engineers, and to the Faraday, Optical, and Röntgen Societies. Admission in all cases will be by ticket only.

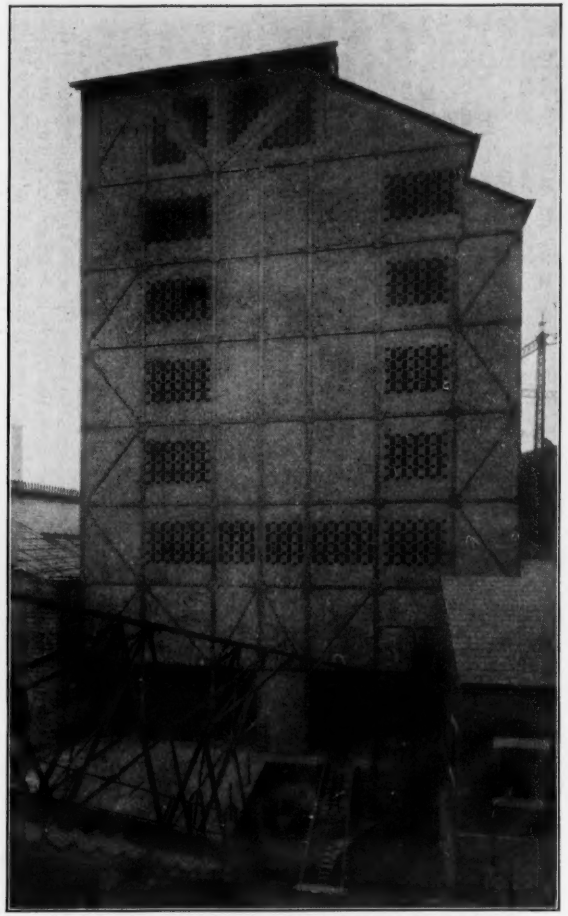
GLOVER-WEST VERTICAL-RETORT INSTALLATION AT NELSON, LANCS.

Description of the Plant.

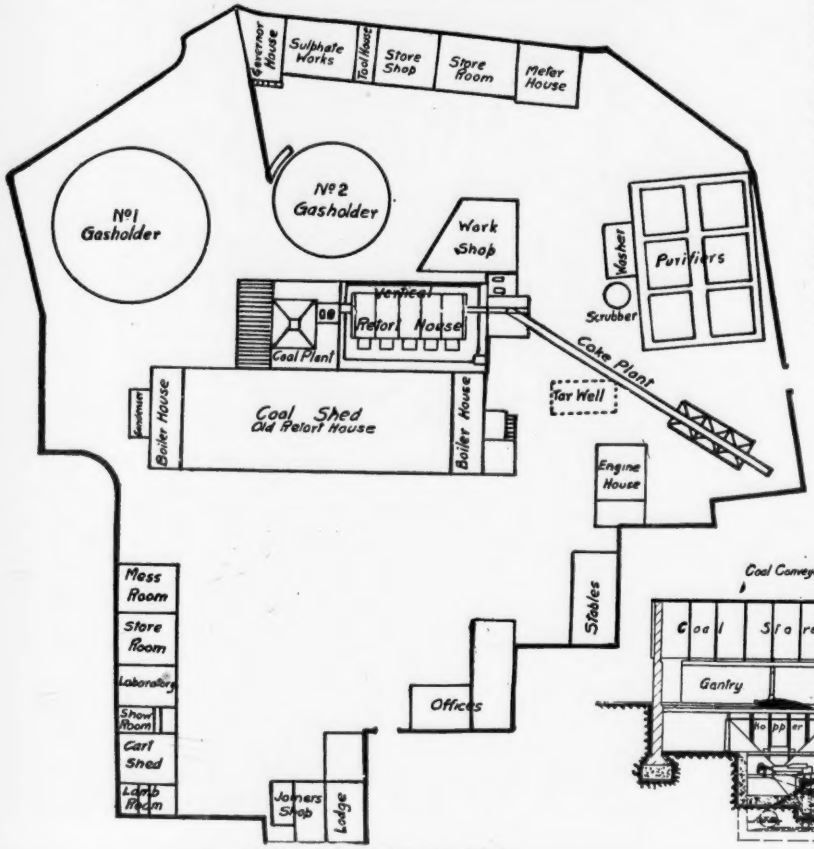
In May of last year, the Nelson Corporation Gas Committee, having decided that the then existing carbonizing plant at the Central (or Nelson) Gas-Works should be superseded by a modern system of increased capacity, appointed a Sub-Committee to obtain full information regarding various methods of carbonization; and the following September, the Sub-Committee reported that they were of opinion that the Glover-West vertical retort system was the most efficient and suitable carbonizing plant to be had. It may be interesting to set forth the reasons they gave for arriving at this conclusion, which are as follows: "The immediate necessity of providing for carbonizing plant to meet the increasing consumption of gas. The fact that the scheme now presented will increase the capacity by 24 per cent., while not decreasing the annual revenue. The improved method of gas manufacture in vertical retorts will ensure a purer atmosphere in the centre of the town. The conditions of labour will be far superior to those obtaining on any other system of carbonization. The absence of intricate machinery will render the wear and tear and renewals inexpensive. The fact that the present retorts can be allowed to remain until the new installation is completed, thus creating no risk to continuous supply. The retention of the old retort-house as a coal-store, thus saving the extension of the existing coal-store. The fact that with vertical retorts the quantity of naphthalene in the gas is reduced to a minimum."

The Sub-Committee's recommendation was soon adopted by the Gas Committee, and subsequently by the Town Council, with the result that contracts were placed for the retort-house, carbonizing plant, and coal and coke plant complete, with West's Gas Improvement Company, Limited, of Manchester; for the foundations of reinforced concrete, with the Yorkshire Hennebique Contracting Company, of Leeds; and for the excavations and paving, with Messrs. T. Dent and Sons, of Nelson. The excavations and the foundations were commenced last January; the brickwork of the piers to carry the retort-settings, in March; and the complete plant was put into operation on Oct. 12—gas being supplied to the town from the vertical retorts on the following day. The inauguration of the new installation took place yesterday (Monday); and in connection with the ceremony, a description of the work done had been prepared by Mr. A. Morton Fyffe, the Engineer and General Manager of the Gas Department, who pointed out that, the installation having been in operation less than two months, no working results were given. "It can, however," he added, "be confidentially stated that all expectations have been fully realized, and that in every way the plant is satisfactory."

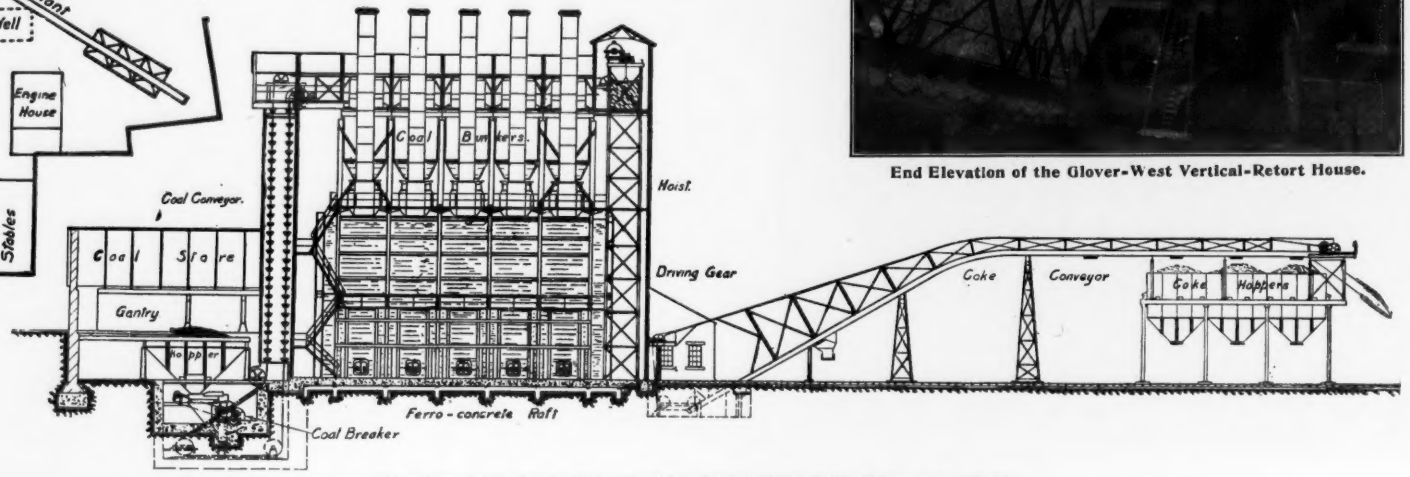
The plant consists of an installation of Glover-West vertical



End Elevation of the Glover-West Vertical-Retort House.



Ground Plan of the Nelson Gas-Works.



Elevation of the Glover-West Vertical-Retort Plant at the Nelson Gas-Works.

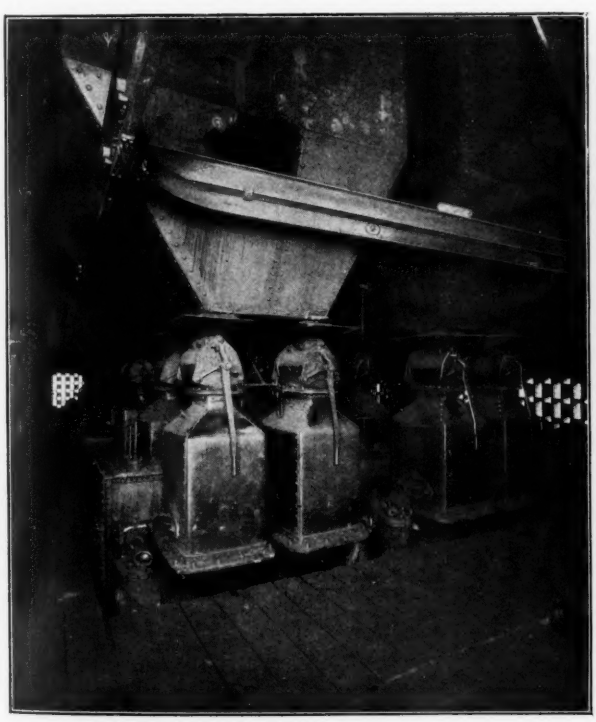
Glover-West Vertical-Retort House, with Coke-Handling Plant.

retorts on the continuous system, and includes five beds each of eight retorts, giving a total of forty retorts, having a capacity of 1,250,000 cubic feet of gas per diem. The retort-bench is housed in a specially-constructed steel-framed building, erected partly on the site of the old coal-store, and partly on vacant ground; and the foundations both for the house and for the retort-bench are of ferro-concrete on the Hennebique system. In addition to the actual carbonizing plant, the installation includes a coal-gantry and receiving-hopper placed in the old coal-store, and also a coal screening and breaking apparatus and elevator and conveyor to transport the coal to overhead hoppers above the retorts.

The coke is extracted from the retorts by the Glover-West patent worm-gear coke-extractor, and is delivered at intervals on to the conveyor immediately beneath the discharging doors, whence it is conveyed to the end of the retort-house, at which point it is fed on to an inclined conveyor, which takes it to the overhead coke-hoppers, from which it is withdrawn into carts or bags as required.

The coal screening and breaking apparatus is actuated by a 17 H.P. electric motor; while the coal elevator and conveyor has a 6½ H.P. electric motor. The coke-conveyors are driven by two motors—of 5 H.P. and 11 H.P.—while the hoist for raising coke to the producers is driven by a 12 H.P. electric motor. The worm-gear for the extraction of the coke is operated by a 6½ H.P. gas-engine; a duplicate being provided to make continuous working certain.

Coal is continuously fed to the retorts at the top; and the coal-bunkers, holding a 48 hours' supply, are filled by an elevator or conveyor, and provided with a number of outlets corresponding to the number of retorts to be supplied with coal. These outlets

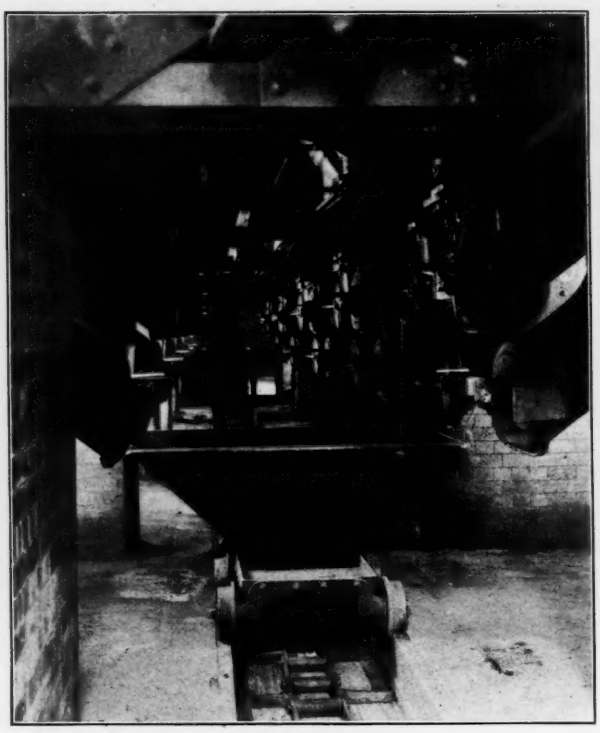


Coal-Feed Hoppers of the Glover-West Vertical Retorts.

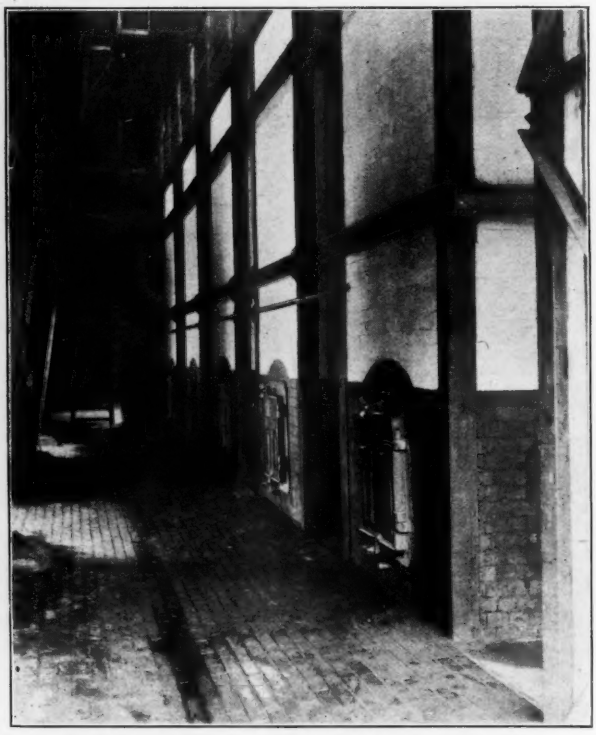
Producer Charging Stage of the Glover-West Vertical-Retort Settings.

Elevation of the Glover-West Vertical-Retort Plant at the Nelson Gas-Works.

Ground Plan of the Nelson Gas-Works.



Coke Chambers and Conveyor of the Glover-West Vertical-Retort Plant.



Producer of the Glover-West Vertical Retorts.

are situated over the coal-feeding hopper, and have slide-doors, which are kept open in order that the coal-feeding hopper below may be readily supplied. The coal-feeding hopper above each retort holds the supply of coal for feeding the retort, and is fitted with a valve which is opened every three hours to replenish the supply. The weight of coal in this hopper assists the charge in its continuous descent by gravitation through the retorts.

At the base of the coal-feeding holder, there is a casting or mouthpiece having at one side an outlet through which the gas passes off from the retort. It is also provided with a covered inspection-hole, which enables the retort to be scurfed and inspected. The sectional area of the retort gradually increases from the top to the bottom, to enable the charge to descend freely, and to permit of the expansion of the charge during the process of carbonization.

The coke is continuously extracted from the retorts at the bottom by means of the mechanical device already referred to. No mechanical device is necessary for feeding the coal to the retorts; the coal passing to the retorts by gravitation, and the rate of feed being entirely dependent upon the rate at which the coke is extracted. Consequently, the rate of carbonization is controlled by the extracting device. The coke, as it is extracted from the retorts, is deposited in a chamber hermetically sealed, and is discharged from it at regular intervals (every two hours) in a comparatively cool state, and requires no quenching by water.

Carbonization takes place from the periphery inwards; but as the charge is constantly moving, the raw coal within the retort takes the form of a wedge which extends through a proportion of the length of the retort dependent upon the rate at which the movement of the charge is maintained. The gas, as it is evolved from the coal, passes to the outlet-pipe through the uncarbonized portion of coal, and through the spaces formed in the mass of coke and partially carbonized coal produced by the continual movement and travelling of the mass from the smaller to the larger area of the retort, and also through the space between the coke and the retort surface.

The Nelson Gas Department supplies the borough of Nelson and also Brierfield, Barrowford, Blacko, Fence, and Wheatley; the combined gas consumption being 400 million cubic feet per annum, and the maximum daily consumption about 2 million cubic feet. In addition to the central works, where the new vertical retorts have been installed, there are the Brierfield works, where there are nine settings of six retorts on the inclined system, having a capacity of 850,000 cubic feet per day. There is also a 400,000 cubic feet Humphreys and Glasgow carburetted water-gas plant, which brings the capacity of the Brierfield works up to 1,250,000 cubic feet per day—the same as the Glover-West verticals at the Central works. Thus the combined capacity of the two works is 2,500,000 cubic feet a day.

The Brierfield works possess both rail and canal connections; but at the Central works all materials have to be carted in and out. The storage plant consists of one three-lift holder at Brierfield, having a capacity of 1,800,000 cubic feet; and two two-lift holders at the Central works, with a capacity of 450,000 cubic feet. The holders are inter-connected by a direct driving main and pumping plant—the intervening distance being about two miles. Sulphate of ammonia is manufactured at both works.

When the Nelson (or Central) Gas-Works were purchased in 1866, the capacity was 300,000 cubic feet a day, and the annual consumption about 50,000,000 cubic feet. In 1887 (at which time the annual consumption was 67,000,000 cubic feet), the works were extended to provide an output of 700,000 cubic feet a day. Since then, until the installation of the verticals, no addition had been made to the carbonizing plant at the Central works, which consisted of twelve settings of six 20 feet through retorts, direct-fired and hand-charged. These settings are at present being demolished. The Brierfield works were purchased in 1890, and were entirely reconstructed; and in recent years the larger proportion of the gas required has been manufactured there.

The business of the Nelson Gas Department has grown steadily. For the twelve months ending March 31, 1886, the make of gas was 62,392,000 cubic feet; while for the last financial year, it was 375,874,000 feet. It is gratifying to learn that this growth is being maintained during the current year. The make of gas last year was 375,874,000 cubic feet; and with moderate prices, there was realized a net profit of £10,012, or 6·39d. per 1000 cubic feet of gas made. The charges were: For general purposes, 2s. 3d. per 1000 cubic feet; for industrial uses, 2s.; for power, 2s., 1s. 9d., and 1s. 6d., according to consumption; and for public lighting, 1s.

Institution of Civil Engineers.—At the ordinary meeting of the Institution last Tuesday, the following were elected as associate members: Mr. D. C. Francis, Rand Water Board; Mr. W. G. Jones, Flint Gas and Water Company, Limited; Mr. Indra Krishna Kaul, Simla Water-Works; Mr. J. Prowett Le Grand, Messrs. Le Grand and Sutcliff; Mr. E. J. T. Manchester, Water and Sewerage Board, Brisbane; and Mr. G. C. Minnitt, Derwent Valley Water-Works. On the same occasion, Mr. H. T. Armitt, of the Santiago Gas Company, was transferred from the class of associate members to that of members; and Mr. F. C. Briggs, of the Gaslight and Coke Company, was admitted as a student.

Gas Affairs at Sydney (N.S.W.).—We learn from Messrs. William Coward and Co., Limited, the London agents of the Australian Gaslight Company of Sydney, that they have received from their principals by cable their acceptance of a tender by West's Gas Improvement Company, Limited, for a second installation of 56 Glover-West vertical retorts, to be erected on the Company's works at Mortlake. The initial installation of 56 of these retorts is at work in the new buildings also provided by the above-named firm. We also learn that the Bill to regulate the provisions for the supply of gas and the adoption of the principle of the sliding-scale, to which reference has already been made in the "JOURNAL," has become law, with amendments satisfactory to all parties. The private measure of the Gas Company, to enable the Board to increase their capital, &c., which has been held in suspense pending this legislation, will now be pressed forward, and effectually relieve the tension caused by the uncertainties involved while the Public Act was under discussion.

AT THE GOTHIC WORKS, EDMONTON.

Anyone desirous of obtaining a clear idea of the dimensions that the London traffic problem can assume on special occasions, could have realized this wish by being present at Liverpool Street Railway Station early on Saturday afternoon. In addition to the normally heavy outflow from the city to the suburbs, a football match at Tottenham attracted, it is calculated, some 40,000 spectators; and of these a large proportion must have elected to proceed to the ground by rail. Perhaps the railway authorities did not anticipate so great a rush; certainly some passengers, and would-be passengers, did not. Business at Liverpool Street one is accustomed to see excellently managed; but the struggling mass of humanity in the booking-hall on Saturday, and the long *queue* of people extending into the station yard, were suggestive of inadequate facilities for the issuing of tickets. And really, when one comes to think of it, in these days of rapid transit, a quarter-of-an-hour does seem a long time to spend in what amounts practically to the securing of permission to board a train. Fortunately, however, many who found it impossible to reach the booking-office windows before their trains had started were able to reach their destination by tram or motor-bus—which illustrates the advantage of the existence of alternative methods of travel. Of course, not everybody was bent on witnessing football at Tottenham. A party of some 200 or more were expected at the Gothic Works, at Edmonton, of Messrs. Thomas Glover and Co., Limited, and R. & A. Main, Limited; and, under the circumstances, the firm probably regarded it as a compliment to themselves that, if anything, rather more than under the anticipated number turned up. But this compliment—if such it were—the visitors found amply returned on arrival; for the welcome extended to them was of the heartiest. Nothing that could be done for their comfort was left undone; and it was quite evident that the arrangements had been made, and were carried out, with pleasure by all concerned.

Here it should be mentioned that the visit was a joint one by the London and Southern District Junior Gas Association and the Junior Institution of Engineers. The former body, at any rate, had made a previous inspection of the works—some eight years ago; and those members who were fortunate enough to have been present on both occasions found ample evidence of the growth of the business of the firm. On all sides there were the clearest signs of that activity which points to the individual and collective welfare of those connected with the gas industry. Messrs. Thomas Glover, A. P. Main, W. R. Glover, and R. B. G. Glover were all present to welcome their guests; and they were assisted throughout the afternoon by the members of the staff, who acted as guides, and by the employees generally, who remained at work so that the members might see everything in operation. Not only was the Saturday afternoon devoted by all those on the works to making the gathering a success, but, what is more, it was willingly given up to this purpose; and this was fully appreciated by the visitors. From the moment when the inspection was first suggested, the employees showed nothing but anxiety to fall in with the arrangements; and the recording of such an incident as this is a real pleasure. On arrival, parties of about ten were made up, and these were, at short intervals, started under their guides on the tour of the works. With so much ground to cover, and so many interesting things to see, the time at disposal was, of course, nothing like sufficient to allow of a thorough inspection of every department. But so completely had everything been mapped out, that not a moment was wasted from start to finish; and, in addition to the explanations of the guides, it should be stated that a *souvenir* was presented to each guest, in the shape of an excellent and profusely illustrated description of the works. That more than a single afternoon would be necessary to enable one to become thoroughly acquainted with the Gothic Works is evident, when it is remembered that the total area of the buildings now approaches 7 acres. They are added to as the continuously growing business demands; and it is satisfactory to learn that the ground secured is ample to allow of many more extensions. And this is only one of the firm's works. There are also Gothic Works at Falkirk and in Birmingham.

The tour was begun in the canteen and workmen's mess-room—a well-ordered building, provided with complete appliances for cooking by gas, and, among other things, with a co-operative store under the men's management. Next came the Middlesex County Council Meter Testing Station, over which members were shown, by the courtesy of the Inspector (Mr. W. E. Barney). It was explained that the Council, having adopted the Sales of Gas Acts, arranged for the erection of this building close to its source of supply, and equipped it throughout with instruments made in the adjoining factory. The apparatus consists of sixteen 11-foot and one 20-foot standard test holders, each fitted with experimental meters, King's gauges, and burning-off lanterns. The test-room is a fine building, 70 feet long by 45 feet wide, lighted by day entirely from the saw-tooth roof by fanlights, which are movable outwards for ventilation. A gas-engine is installed for driving a fan at the end of the building; the air supply being drawn through underground ducts, and passing over pipes which in cold weather are heated on the thermo-syphon system from a coal-fired boiler, the air is warmed to bring the test-room to the standard testing temperature. The station (which is one of the most recently equipped, and provided with the very latest instruments, including 20-light and 100-light standard wet meters) is equal to an output of 2300 meters per week; and during the twelve years it has been in operation, up to last Saturday, there have been tested 994,553 meters, the great bulk of which have been made or repaired in the Gothic Works.

Various ingenious machines in the offices furnished evidence of the extent to which in these days labour-saving devices are available for office use as well as on works; and on leaving these, attention was drawn to the fact that the works are connected with the Great Eastern Railway by a siding which runs the whole length of the main building. Shunting is carried on by means of a petrol locomotive, designed and built by the firm from what was practically scrap material; and though the small engine is only 10-H.P., it has carried out its function now for many years, with the greatest smoothness and at far less trouble and cost than was the case when horses were employed. "This," says the printed description, "by way of emphasizing the importance of moving with the times, or with petrol." A fair response would be that the arrangement is undoubtedly an example of "engine"-uity. In the lamp-shop there was much to see; but attention was attracted by a promising looking experimental self-intensifying type of inverted burner street-lamp, which had the automatic lighting and extinguishing device altogether hidden from view in the base. This shop, it is stated, is capable of turning out 400 "Gothic" street-lanterns per week. In fact, 3000 insect-proof copper and brass lanterns of this type were turned out and dispatched to Calcutta within thirteen weeks, at a time when the building was only half its present size. Each lamp consists of no less than 139 parts. Mention of the "Gothic" gas pressure blower, calls for a remark on the excellent charac'er of the high-pressure lighting throughout, which is quite a feature of the works.

Passing through the pattern-store, the visitors came to cupolas for metal melting, and then to the foundry, where the operation of pouring into moulds was witnessed. This foundry has from time to time been increased in size, until at the present moment 25 tons of metal are being melted per day in connection with the firm's gas-stove business, necessitating the employment of something like a hundred moulders and other men. This is good, for what is really a branch of the larger or parent business in Falkirk, which employs hundreds of men on similar classes of work the year round. Each casting is critically examined and sounded before being passed as fit for stock; but the proportion that it is found necessary to consign to the scrap-heap is a very small one. Special treatment is accorded to radiator tubes, by reason of their use with steam under pressure; every tube being tested hydraulically in a machine designed for the purpose. After the grinding and polishing shops, came the chemical laboratory, which is provided with special apparatus for testing the efficiency of new ideas before they are embodied in the various manufactures—especially as regards gas fires, stoves, and cookers and water-heaters. For these purposes the firm have the Leeds test and others; but they have also devised their own tests, which, in addition to being quickly carried out, are found to be sufficiently accurate for all practical purposes. A particularly interesting, and exceedingly simple, test is that which has been developed for ascertaining the hygienic efficiency of gas-fires. Speaking of tests, another noteworthy fact is that every cooker and fire made in the works is before being sent out tested by the firm at one pressure—2½ inches. An effective arrangement has been devised, too, and is manufactured throughout by the firm for testing meters, in which, instead of having to rely upon the eye for reading, one depends upon electrical contact.

The fitting and enamelling shops received due attention, and admiration was bestowed upon the beautiful colours obtainable by means of the majolica enamels employed. These colours are specially for the outside of the different fires; but enamelling is not confined solely to those parts of the articles which meet the eye. Most of the burners are enamelled on the inside, because the smoother surface thus secured quietens the issuing gas as it enters the burner. Not all, however, are treated in this way, because some people are of opinion that the rougher the interior surface of a burner is, the more efficient it is for securing proper mixture before the gas reaches the nozzle for combustion. The producer furnace in connection with the existing enamelling plant was designed by, and erected under the supervision of, Mr. A. E. Broadberry, the Engineer and Manager of the Tottenham and Edmonton Gas Company; and he is also arranging the putting down of further furnaces for a like purpose. Through the smithy, the visitors passed to the engineering shop, with its magnificent array of power tools. All the special machines and tools employed in the works are designed and manufactured in this department. Here they saw two high-pressure gas-furnaces, for hardening, tempering, and annealing, together with the installation of small gas engines and blowers supplying the high-pressure gas for lighting and heating the greater part of the factory. There were also seen in operation an oxy-acetylene welding plant, and the cutting of metal by ordinary coal gas used in combination with oxygen. Though this latter method is not so rapid as when acetylene is employed, it is pointed out that it is interesting as opening up further possibilities for the use of coal gas.

The meter portion of the business next came under review; the fine big meter shop, and the machines for stamping, &c., being the object of many appreciative remarks. In the leather shop much very important work in connection with a meter is carried out; and the character of this was explained, so far as time would permit. In the brass shops there were inspected row upon row of automatic and semi-automatic machine tools devoted to the

VIEW IN THE GAS-METER TESTING STATION.

manufacture of the various brass and white metal parts that make up a prepayment or ordinary gas-meter. The average capacity of the works, it is stated, is over 60,000 new meters a year; and some idea of what this involves will be gathered from the statement that a prepayment meter contains 262 separate parts. It was noted that all the tinmen's fire-pots are heated by high-pressure gas, which is found to be a cleaner, more economical, and purer form of heating than the old charcoal method. Each pot has its flue-pipe piercing the roof; and by the simple plan of entering this smaller pipe into the bore of a larger open-ended pipe, an injector action is obtained which effectually ventilates the whole roof, and at the same time leaves the fans which are provided round the side of the building free to indraw large volumes of fresh air. The circuit of the works was completed with the stores, packing and despatch department, paint shop, and brass foundry.

In connection with the extent of the firm's operations, it is pointed out that though it took 56 years to make the first million meters they turned out, it bids fair to take less than 20 years to make the second million. These, of course, are new meters; but the repair side of the business is also a large one. Gas is used everywhere for all possible purposes; and the result is a yearly consumption of 30 million cubic feet, with which the works are supplied practically direct from the Tottenham Gas-Works by two 6-inch mains and one 8-inch. In addition, the heating of the enamel muffles, brass melting, and warming stoves involves an annual consumption of 1000 tons of gas coke. All told, the works employ close upon a thousand men.

Tea followed the inspection, and some appropriate speeches followed tea. The remarks made, and the cordiality with which they were received, showed how much the visitors appreciated all that had been done for them.

THE METER SHOP.

Mr. PLATTEN, the Chairman of the Edmonton Urban District Council, in proposing that the best thanks of the assembly be given to Messrs. Glover and Main for their great kindness, drew attention to the immense growth of the firm's business, and said they were not merely up to date, but were actually anticipating things that were to come.

Mr. R. GREEN, of the Middlesex County Council, who seconded, remarked that they had all been delighted with their afternoon, and would remember what they had seen there for a long time to come.

Mr. D. J. WINSLOW, the President of the London and Southern District Junior Gas Association, remarked on the great value that had been added to the visit by the fact that the men had remained at work, so as to show the various processes in operation, and alluded to some of the special features of the works—particularly the excellent laboratory for testing gas-fires, &c.

Mr. MARSHALL, on behalf of the Junior Institution of Engineers, said his members had visited many firms, but he had never seen better arrangements made for conducting them over works. They appreciated what it meant to give up a Saturday afternoon, and felt how much they owed to the staff and the employees generally for having done so. His Institution were pleased to have been associated in the visit with the London and Southern District Junior Gas Association.

Mr. W. J. LIBERTY also briefly supported the vote, remarking that, though the London Juniors were at the works about eight years ago, the great advances made in the interval had fully warranted this second visit, which had been so much enjoyed.

The resolution having been carried with hearty applause,

Mr. THOMAS GLOVER, in acknowledgment, said it was very gratifying to the firm to have the opportunity of welcoming so many visitors that afternoon. When the visit was first suggested, he took immediate steps to ascertain the views on the subject of the workers in the factory; and he was exceedingly pleased to find that all of them were only too anxious to do everything they could to make the gathering a success. This they had done. He referred to their indebtedness to Mr. Barney, of the Middlesex County Council meter-testing department; and touching upon the importance of the Junior Association movement, said the address which Mr. Winslow had recently delivered was an exceedingly valuable record of research work.

Mr. A. P. MAIN also, in a few well-chosen words, expressed the pleasure of the firm in receiving the visitors at their works, and said he hoped that the afternoon had proved both profitable and enjoyable to them.

MANCHESTER UNIVERSITY LECTURES.

Suggestion to Gas Engineers by Professor Dixon.

The second of the series of lectures arranged to be given at the Manchester University this session under the auspices of the two District Gas Associations (in conjunction with the University authorities) was delivered last Saturday by Mr. Franklin Thorp, of Manchester, who took for his subject "The Mixing of Gas and Air for Lighting and Heating." Additional interest was centred in the fixture from the fact that the lecturer for the day is a Past-President of the Manchester and District Junior Gas Association, and that it was really through the suggestions contained in his Presidential Address to the members of that body in 1910 that a closer connection has been set up between the Manchester University and those engaged in the gas engineering profession—the lectures each session being one result. There were about eighty present on Saturday. The chair was occupied by Mr. T. DUXBURY, the Gas Engineer to the Oldham Corporation.

The CHAIRMAN, introducing the lecturer, said it was a pleasure to have "one of their own" to address them, and one who was a great authority on the subject to be dealt with. Mr. Thorp had spent a lifetime in experimental work, and now he had brought his experiments to such a stage that they had become of practical use and were bearing fruit.

Mr. THORP, in the course of his address [a detailed report of which will be published in a future issue of the "JOURNAL"], carried out many experiments in illustration of the points dealt with. One experiment that aroused a good deal of enthusiasm was the burning of an incandescent light placed within a hermetically sealed globe and submerged in water—a beautiful effect being obtained. The mixture of gas and air went down a central tube to the lamp, another tube conveyed the additional quantity of air required, while a third tube carried off the products of combustion. One specially noteworthy remark made by the lecturer was that it was now easily possible to get 60 candles per cubic foot with high-pressure gas.

Professor HAROLD B. DIXON, who moved a vote of thanks to Mr. Thorp at the conclusion of the lecture, said he had been struck with admiration at the manner in which the experiments had been conducted; and he had again been forcibly reminded of the advantages likely to accrue to the gas industry and the general community from a closer bond of union between those at the University and the practical gas engineer. He would be delighted to see gas engineers sending along problems which troubled them, or were found difficult of solution, as he believed that in this way much useful knowledge would be gained.

Mr. THOMAS DUXBURY (Manchester and Darwen), in seconding the motion, warmly complimented the lecturer on his ability as a gas lighting and heating expert.

Mr. D. V. HOLLINGWORTH, the President of the Junior Association, supported the motion; and it was cordially adopted.

Mr. THORP, who was greeted with applause, acknowledged the vote, as did Mr. HARVEY THORP, who had assisted in the experiments.

A vote of thanks was accorded to Mr. Duxbury for presiding, on the motion of Mr. BUCKLEY (Manchester), seconded by Mr. W. L. HEALD (Preston); reference being made to the very active interest he had always taken in the Junior Association, and the support he had given to its advancement as an educational agency.

Discussion on Incandescent Lighting.

Following an adjournment for tea, most of the Juniors remained to take part in a discussion on "Incandescent Lighting." It was more of a "round table" talk, freed of all formalities; but some very useful hints were given as the result of experiences, and much valuable information was imparted.

Mr. S. CARTER (Garston), one of the earlier speakers, supplied interesting data on eight years' working with the Scott-Snell lamps; and in giving his experiences as to the products of combustion, he said that when 4-inch steam-pipes were used, and lead pipes run in them, and provision made for the outlet of condensed vapour, &c., no trouble had been experienced.

Mr. BUCKLEY contributed a series of instances to show that the mantle, used for incandescent lighting and the position of the nozzle within the mantle had a great deal to do with the illuminating power obtained; and he described how, by shortening a mantle, and by altering the position of its supports, a difference was made and improvement effected.

After Mr. JAMES TAYLOR (Mossley) and Mr. W. L. HEALD had contributed to the discussion, Messrs. F. and H. THORP answered a number of questions on the subject; and this concluded a very instructive evening meeting.

COAL STACKING AND COAL FIRING.

Mr. Kendrick's Reply to the Discussion.

To the great regret of the members of the Manchester District Institution of Gas Engineers, Mr. H. Kendrick, of Stretford, was, as stated last week, prevented by ill-health from being present to read his paper on "Coal Stacking and Coal Firing," and to deal with the remarks made thereon. He has since forwarded for publication the following reply to the discussion.

I am very grateful to the President for so kindly taking upon himself the burden of reading my paper; and to the members for their very cordial reception of it. The necessarily limited public discussion is in agreement with most of my deductions; and if some of the remarks apparently not in agreement are further examined, it will be found there is very little between us. All the speakers' experiences related to different material from that which I described, and their troubles would not likely be so frequent.

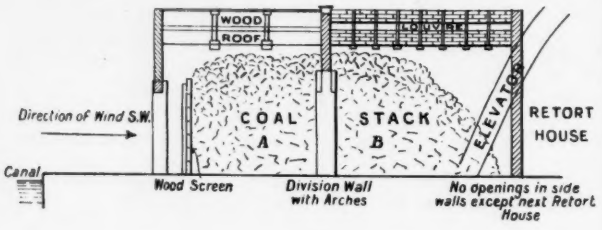
Necessarily, the series of suggestions at the end of the paper are "ideal;" and I can only trust that we shall all endeavour to get as near to the "Millennium" as possible. Attaining perfection is extremely difficult; and few ordinary gas engineers expect to get there at once. Still, something can be done. If we cannot restrict the heights of our coal-stacks, we may be able to build them up slowly and evenly, allowing the coal time to cool before the next lift is built up. If we cannot entirely avoid stacking damp coal, we can stack as little as possible, and keep it separate to a very great extent from the dry coal. If we have not room to stack different qualities separately (and it is not always impossible to provide for it), we can at least find out which coal gives most trouble, and eliminate that from our stacking operations in the future. And in designing further coal-stores, greater area can be allowed than in the past. Working on these lines will bring us nearer to the ideal. In my own case, it is impossible at present for me to work to the ideal; but certain precautions I can take, which will minimize trouble in the future. This is the most we can expect anyone to do immediately.

In my opinion, it would be better that coal stacked under cover should be lower than when stacked in the open; for the rate of cooling will be greater in the latter case than in the former, as the circulation of air over the surfaces will be much greater. The height of stacks will depend on the material; and when a limit has to be stated, it is always advisable to fix it on the low side, leaving it to the individual to fix the maximum heights according to the class of material being dealt with. Hard screened coal, for instance, may be stacked much higher than slacks, as it will resist the crushing strain of the superincumbent mass much more than smaller and softer coals, and there will be less pockets of small and dant formed by pressure to absorb oxygen and become overheated. If it were possible, I would say stock only screened hard coals; then only are we likely to be practically free from fires. But as some of us consider that such a policy would be ruinous to our several undertakings, we must take the risks, which can, by observing certain small precautionary measures, be reduced to a minimum.

The tubes we use for ascertaining the temperatures of the

interior of the coal-stacks are not open pipes, but have the bottom welded-up, to prevent a current of air drawing through them, and are placed in position before the coal is stacked. One suggestion for these tubes I intend trying next season, in the part of No. 1 shed which is most subject to heating. It is to drill holes in the pipes at fixed intervals, and screw on an air-tight cap at the top; so that, if any heating does take place, ammoniacal liquor can be poured down in order to extinguish any possible fire or reduce the temperatures.

The construction of our No. 1 coal-store may have something to do with fires occurring there; but I do not think the louvre would allow an excess of moisture to penetrate the coal, as only northerly winds could drive rain inside. The following is a longitudinal section of the store.



It would be possible, with screened coal stacked at A, as was the case in 1908 and July, 1912, for the prevailing wind to penetrate the coal-stack in the direction of the louvre over B—there being no side openings. But as the fire in 1908 was started by a defective steam-pipe, and spread towards the opening at the canal side, and that of 1912 was on the floor underneath 20 feet of slack, I do not think that at all likely, and am still of opinion that the 1912 fire was due to spontaneous combustion caused by the absorption of oxygen and the pressure of the superincumbent mass. The recent heating nearly in the same position (that of July last), which has now subsided, would have developed into a fire before now, if the draught theory were correct. The worst places each time have always been in the vicinity of the conveyor, which plainly proves that the dant is responsible for the fires.

I cannot see any contradiction in my description of what we found in the coal fire of 1908. I am only stating facts. The layers between the nuts referred to were slack, and any heat there was due to the coking of the nuts; while in the dust the heat was due to absorption of oxygen, and arose from another cause. But we obtained flame in both cases in moving the coal, though I did not specifically state so.

METHODS OF ECONOMIZING HEAT.

As briefly mentioned in the "JOURNAL" last week, the first of a series of three Cantor Lectures on the above-named subject was delivered on the evening of the 2nd inst., at the Royal Society of Arts, by Mr. Charles R. Darling. It may be remembered that, two years ago, Mr. Darling delivered a course of lectures on "Industrial Pyrometry," which were noticed in the first volume of the "JOURNAL" for last year. These were considered by the Council of the Society to be so satisfactory, that they requested him to undertake a second course. At the outset he referred to the sources of energy which have not yet been utilized for commercial purposes—including solar radiation, the force of the tides. and the internal heat of the earth—and said he believed these would be available when the supply of fuel was exhausted, Speaking of the different kinds of fuels, he said he need not refer at any length to the liquid class, as these were to be the subject of a subsequent series of lectures (by Professor Lewes). On the subject of the economical combustion of fuels in furnaces, the lecturer emphasized the point that the products of combustion should pass out at the temperature of the heated object, or loss of heat must occur; and he suggested that arrangements might be made for a co-operation of industries for the utilization of the waste heat from furnaces. A description was next given of the Bennis and other mechanical stokers and appliances for the abatement of smoke, and attention was directed to the value of CO_2 recorders, two of which were exhibited and fully explained. The lecture, which was illustrated by experiments and lantern pictures, concluded with an interesting demonstration of the Bonecourt system of surface combustion, the application of which to a steam-boiler would, it was stated, give a thermal efficiency of more than 90 per cent. It was considered possible that economy might be realized by utilizing the gas from coal for raising steam by this system, and selling the residual products, instead of burning the coal in the ordinary way. In last night's lecture, Mr. Darling dealt with the disposal of heat in various types of engine; and next Monday, he will take up the subject of domestic heating.

The Scottish Junior Gas Association (Eastern Section) will next Saturday afternoon visit the works of Messrs. Alexander Cross and Sons, Limited, at Falkirk.

INDIRECT LIGHTING.

A paper on this subject, of almost appalling length, was read at the meeting of the Illuminating Engineering Society last Tuesday, by Mr. F. W. WILLCOX and Mr. H. C. WHEAT. The following are extracts relating to the more general parts.

The artificial production of light is perhaps the most inefficient and wasteful process to be found in any branch of engineering or science. This very fact is the strongest possible argument for the necessity for "efficient" lighting—*i.e.*, for using such arrangements of artificial light sources as will most economically meet the demand for properly distributed light. Efficiency of lighting is here to be used in the wider sense of visual efficiency, and not in the narrow sense of simply physical returns for energy expended —*i.e.*, lumens or foot-candles per watt of electricity or 1000 cubic feet of gas. Systems of illumination cannot always be rated in terms of energy efficiency. In the case of lighting, the term "efficiency" must be used in a broader sense of general visual efficiency, by which is meant the effectiveness of the illumination secured in enabling us to see things easily and in comfort. Mr. Bassett Jones, in a recent paper on interior illumination before the American Institute of Electrical Engineers, says: "The work to be done by many lighting arrangements is not only to be able to see and work with ease and comfort, but also to make the interior pleasant to the senses, and make its beauty visible."

In approaching this subject, not only is it necessary to have the foregoing considerations in mind, but also to remember that light and illumination cannot be measured in physical terms alone, but involve physiological and psychological facts and considerations as well. More stress should be laid on the necessity for natural, rational, and comfortable illumination. Some systems of lighting in vogue are not only ineffective and inefficient, but positively annoying, owing to the exposure of glaring sources of light, which effectually defeat their real purpose. Faults and deficiencies of lighting have in the past been very largely due to a lack of suitable lighting appliances. It has only been in recent years that apparatus for producing satisfactory and effective illumination has been available.

The idea of indirect illumination is not exactly new. We have had indirect lighting installations in years past; the most well-known application being the "cove-lighting." According to this method, lamps are secreted in a groove or cove on the side walls below the ceiling-level, so that the reflected light is thrown out on the ceiling, and thus indirectly reflected on to the floor or objects. The limitations of such a system (which could frequently not be employed without structural changes in the building) and its comparative inefficiency gave rather a bad name to indirect lighting. This is responsible in a large measure for the very general impression that the indirect method of lighting is necessarily expensive and prodigal of current. The success of indirect lighting awaited the development of new and improved appliances. This result was secured by the introduction of the system known in America as the "eye-comfort," and in England as the "eye-rest" system of illumination. This system of indirect lighting employs a fixture in the form of an inverted bowl suspended from the ceiling of the room. These bowls contain highly efficient and powerful reflectors of special mirror glass construction. They are scientifically designed to give the most effective distribution of light for indirect lighting methods. The reflectors are opaque, and opaque containers are also used.

It should be noted that indirect lighting must be done in a really scientific manner to be successful; and herein lies the secret of the success of this particular system. In the attempt to get away from bare lights and excess brilliancy, the natural step was to increase the light-giving area. This was generally done by the use of diffusing globes over the lamps. The indirect system went a step further, and increased the light-giving area by using the largest available surface in the room—that of the ceiling. This was, however, somewhat too radical for the ideas of many experts, who could not agree to such a solution of the problem. Yet the first development, applied in a small way, steadily grew, and its popularity forced many to reconsider their theories on this subject, and to study the causes which have contributed to this success. This, among other things, has led to the consideration of the physiological and psychological factors affecting satisfactory illumination. Much light has thus been thrown upon the more effective use of artificial illuminants, and upon such questions as: Why fatigue and visual depression occur to a larger degree under artificial light than with daylight? Are such faults inherent in the quality of the light itself or in the methods of its use? And, seeing that daylight is apparently so effective, how can one best produce daylight effects from artificial lights?

VARIOUS SYSTEMS OF ARTIFICIAL LIGHTING.

In order to study the relative merits of indirect light in comparison with other methods, it will be in order to consider and review the various systems of artificial lighting in effect to-day, which can be discussed under four headings.

(*a*) *Direct Lighting* comprises systems in which the greater part of the illumination is received directly from the light units or sets of lamps and reflectors.

(*b*) *Direct Lighting* in which the greater part of the illumination is received directly from a light source enclosed in diffusing globes, as, for example, Holophane spheres, Holophane bowls, and Alba spheres.

(*c*) *Semi-Indirect Lighting* in which the light is partly transmitted directly from the lighting units through a diffusing medium, and partly indirectly by reflection from the ceiling or other surface.

(*d*) *Indirect Lighting* in which no light is received directly on the illuminating plane, but only indirectly through reflectors from a second surface or body. In the form of indirect lighting considered under this heading the light is directed away from the objects to be illuminated and thrown upon the ceiling, from which it is reflected upon the working plane.

(*a*) Direct Lighting with Reflectors.

(1) *Economy.*—This system of illumination admittedly offers the greatest opportunities for physical efficiency—*i.e.*, intensity of illumination as expressed in foot-candles from a given energy expenditure. This does not, however, mean the highest general efficiency of the lighting system, using the term in its broader sense of visual efficiency.

(2) *Glare from Light Source or Reflector.*—This objectionable factor exists to the highest degree with this system of lighting, though much can be done to mitigate the defect by proper methods.

(3) *Shadow Effect.*—Shadows are undoubtedly sharper and more pronounced with this system of lighting, and therefore direct lighting necessitates a larger number of lights to ensure satisfactory results on this score.

(4) *Evenness of Illumination.*—While very good in an unoccupied room, difficulties arise with the presence of objects and people; so that here (as in the case of shadows) it is necessary to employ a large number of points to ensure satisfactory results.

(5) *Comfort and Agreeableness.*—In general, this does not come up to the standard attainable with the other systems, although much can undoubtedly be done by proper methods to secure better results in this respect.

(*b*) Direct Diffused Lighting.

(1) *Economy.*—The economy of diffused lighting is considerably reduced by absorption of the diffusing medium—the bowl or sphere. This reduction is considerably larger than is generally appreciated, and may easily reach 50 per cent., and with good diffusion it will be at least 20 per cent. in any case.

(2) *Glare.*—This is considerably reduced, particularly with certain forms of opal enclosing spheres.

(3) *Shadow Effect.*—This is undoubtedly improved, the shadow edges are not so sharply defined, although rather heavy shadows may still be produced.

(4) *Evenness of Illumination.*—It is difficult to definitely state its comparative value on this point, as it will depend in a large measure on the number of points and their location. It must be remembered that the low intrinsic brilliancy of suitable diffusing globes permit these to be suspended with comfort and satisfaction in or above the line of vision in positions unsuitable for direct lighting units; and it is thus possible in many cases to secure a uniformity comparable with indirect lighting, although it must be noted that the distribution is not as definitely under control in such cases as with direct lighting, employing scientifically designed reflectors. In general, with an equal number of points, the system is fairly comparable in uniformity with indirect lighting.

(5) *Comfort and Agreeableness.*—The system may not be as comfortable and agreeable as a properly designed direct lighting system, if the units of light globes and spheres have to be suspended below the line of the ceiling, and therefore act as more or less glaring sources in the line of vision. On the other hand, if sufficiently dense diffusing globes are used, the intrinsic brilliancy is low enough to give most agreeable effects even with the sphere directly in the line of vision.

(*c*) Semi-Indirect Lighting.

(1) *Economy.*—In actual physical efficiency this system occupies an intermediate position between direct lighting with reflectors and indirect lighting. As this system employs a diffusing bowl or globe for the direct component of the light, it is possible to have it equal and even exceed in economy the direct diffusing system of lighting.

(2) *Glare.*—This depends upon the character of the diffusing bowl or globe through which the direct component of light is transmitted. With care in selecting a suitable material for the bowl or dish part of the indirect fitting, glare may be brought within reasonable limits, and in this way the system made to appear not only ahead of the direct systems (both reflecting and diffusing), but to compare favourably even with the complete indirect lighting system.

(3) *Shadow Effect.*—Here again the results will depend upon the character and density of the bowl, or translucent bowl, or dish part of the fitting.

(4) *Evenness of Illumination.*—This system of lighting can be arranged to give very excellent results in this direction, provided the density of the container or translucent portion of it is kept within proper limits (to make the direct component not over 15 per cent. of the total illumination). In no case, however, does this system surpass the indirect lighting system on this important point.

(5) *Comfort and Agreeableness of Lighting.*—Excellent results comparable with the best effects from the wholly indirect system can be secured with proper regard to the density of the translucent portion of the container, and keeping the direct component within the limit of 15 per cent.

Indirect Lighting.

(1) *Economy.*—While on the score of pure physical efficiency in lumens per watt, this system may stand below the others, yet in point of general visual efficiency its general results are comparable, and in many cases superior to the other systems. Even the physical efficiency of indirect lighting systems is often considerably ahead of that of installations, which it replaces, so that the adoption of the indirect lighting system in numbers of cases actually reduces the energy consumed.

(2) *Glare.*—Glare is undoubtedly reduced to the minimum by the indirect system of lighting. The lamps themselves are entirely hidden, and the greatest surface brightness, that on the ceiling, is very much lower than with any other form of lighting. The very large surface of the ceiling acts as a virtual source of lighting, giving almost perfect diffusion with an entire absence of the uncomfortable effects associated with glare.

(3) *Shadow Effect.*—On this point the indirect lighting system stands pre-eminent. Shadows are less dense, and the edges softer. It would be a mistake, however, to assume that this lighting is shadowless, as this would make it objectionable. It casts shadows of a character which avoid their disadvantages, and secure the advantages by preventing any flat effect that may occur under other systems of indirect lighting such as cove-lighting.

(4) *Evenness of Illumination.*—The indirect system of lighting surpasses all other systems in this important point and, properly installed, gives the best results from the fewest number of points. It is one of its important advantages that it requires much fewer outlets than the direct system. The difference is that with the indirect system of illumination we treat the illumination of a room as a whole, while with direct lighting we may have to treat it in parts or sections.

(5) *Comfort and Agreeableness of Lighting.*—On this point it may be contended that the best results are obtained by the indirect system. A restful and beautifully diffused illumination is obtained, the conditions resembling those when daylight enters a room through a skylight or obscured glass roof. With proper tinting of the walls, the light can be toned to give rich, warm, attractive effects. Severe contrasts, glare, and heavy shadows are eliminated, with the result that the architectural features of the room appear to the best advantage.

It is perhaps the quality of "naturalness" which makes the illuminating effects of the indirect system so comfortable and agreeable. It is the characteristic of good lighting to be unobtrusive.

Objections to Indirect Lighting.

The author then passed on to consider the objections that have been raised to indirect lighting, such as the excessive brightness of the ceiling and the brightness of the walls, the latter of which they contend can be tinted to any degree of subdued shade desirable. Then there is the dark appearance of the under part of the bowl of the indirect fittings, which they submit can be decreased by using a light coloured or white bowl. As to absence of shadows and flatness, with the "eye-rest" system, it is held that shadows are there, but are not very noticeable, because of the complete diffusion of the light. Respecting coldness and cheerlessness of the light, it is contended that this is in the main due to feeble illumination. Concerning the difficulty of keeping the fittings clean, it is submitted that there ought to be no more trouble about this than in dusting the furniture of a room. The writers were weak on the point as to cost of indirect lighting, though stating that they had numbers of comparisons showing that indirect lighting has effected a material saving in many cases in energy consumption over previous systems. However, they also said: "Indirect lighting may cost more, but it does more. If the systems of direct lighting were compelled to give equally uniform and satisfactory lighting with the indirect, they would also require a material increase in wattage."

POINTS FROM THE DISCUSSION.

Opening the discussion, Mr. Frank Bailey said the authors had rightly emphasized the question of glare. Glare, however, existed and would have to be endured, unless some method of indirect or semi-indirect lighting were adopted. More experience of both systems was wanted before any decision could be come to as to comparative merits. He did not consider that the spotty effect of a dark globe suspended from a ceiling was so pleasant as the semi-indirect method, with the reflecting power of the semi-transparent globe. The users were the persons whom it was desired to educate to the new methods, the people who, as time went on, would suffer incredible discomfort from the use of tungsten lamps exposed naked to the eye. In this way the members might have an opportunity of placing before customers the serious dangers attending the progress of lighting when accompanied by such a terrible glare. The bad lighting effect by electric lamps of the Hall of the Society of Arts, and in other rooms where incandescent gas-mantles were entirely unshielded, was referred to. If Mr. Haydn Harrison adopted the system advocated by the authors, he said he would require five times the amount of energy at present used. He preferred the semi-indirect to the direct system of lighting, and proceeded to comment on the question of the flatness of indirect light. Mr. Charles Baker thought that the authors had not, in connection with indirect lighting with inverted

bowls, attached sufficient importance to the cleaning. Bowls hung up from the ceiling were very difficult to get at, and great expense would be involved if they were to be carefully cleaned very often. If with the indirect system the general results were to give equal satisfaction, the consumer would have to pay much more to get the same amount of light.

As Chairman of the Building Committee of the Institution of Electrical Engineers, Mr. W. M. Mordey said he had, when considering the lighting of the new theatre, put forward the proposal that there should be no exposed lights at all. This was adopted; and although the results had been criticized, regular users of the theatre would agree that the lighting was quite satisfactory, even if the impression produced by it on entering was one of dimness. If seeing had a mental effect, people could see better with a bad light and comfort than with a good light and discomfort. The speaker had once been blamed by the "JOURNAL OF GAS LIGHTING" for making use of the expression "whiplash on the eye" as an effect of modern lamps; but he thought the general necessity for some method of indirect lighting justified the term. Mr. J. G. Clark exhibited a gas-fitting on the semi-indirect system, pointing out that it could be easily modified to the indirect. Mr. D. A. Louis, Mr. T. E. Ritchie, and Mr. V. H. MacKinney followed. The last-named thought that the particular systems were applicable to particular cases. The indirect system was not new; and he thought it should not be put forward as portending detriment or degradation of other systems. It was a different system, and had its own practical application. He would have been glad if the authors had referred to other systems of indirect lighting—such as the semidirect—the units which had now been on the market for several months past. He contended, however, that the semi-indirect system was, for a given unit, more efficient than the indirect, while the semi-indirect unit had the advantage of being convertible into a perfectly efficient indirect lighting unit. Mr. Campbell wished more could have been heard about the working and cost of the indirect lighting system. Some years ago, a friend of his received a prismatic glass reflector of the inverted type for gas lighting. By an accidental circumstance this was put up the wrong way, with the result that his friend got one of the first known semi-indirect units for gas lighting. Dr. Hickman said the indirect lighting system appeared to him, from an architectural point of view, to be excellent; but it seemed a little unsatisfactory for lighting offices and such purposes. He had a feeling that he would like at least one direct unit over his left shoulder. He would not like to do any reading under the indirect system, which did not throw proper light on the object. The Chairman (Mr. A. P. Trotter) felt that what remained to be done was to apply the method properly. In his view, the indirect lighting system was more important for domestic work than for office work. Many people liked a dark office and a well illuminated table. For domestic work, a well and carefully designed form of semi-indirect lighting was the most restful.

Replying to the discussion, Mr. Willcox said Mr. Bailey had indicated a preference for the semi-indirect system. The authors had no wish to make out that there was no field for the semi-indirect system. One of the essential features of good semi-indirect lighting was that the density of the bowl should be such as to ensure that the amount of light transmitted could be kept within a regular minimum. Mr. Harrison had alluded to economy; but he (Mr. Willcox) doubted whether the case was as bad as that gentleman might lead people to believe. Regarding accessibility for cleaning purposes, he had in his own home an inverted fitting which was cleaned about once in four months, and this involved no inconvenience. Fittings in installations were often very high, but the speaker had always advocated the provision of gear in lofty rooms, in order to lower the fittings for cleaning. As to cost, with ordinary conditions fewer points were required with inverted than with direct lighting to obtain the same result. Where one inverted light would suffice for a small room, indirect lighting would probably require four points. In reply to Mr. Mordey, the authors had not claimed novelty for indirect lighting; merely that the eye-rest system was a novel form of inverted lighting. Ten years ago he (Mr. Willcox) used indirect lighting with incandescent gas, employing a green shade inverted over an ordinary incandescent burner. Mr. Mordey, he was glad to hear, confirmed the claim that a lower foot-candle intensity could be used on the working plane with indirect lighting than with the direct method. As to patchiness on the ceiling, it was true that the ceilings were not evenly illuminated; but the aim was not to light the ceiling, but the room or working plane. Distribution of light on the ceiling was easily provided for where necessary by suitable adjustment of fittings and proper control of light distribution. Mr. Mackinney had pointed to the great preference many people had for local lighting. His own experience was of a contrary nature; the majority infinitely preferring the inverted lighting system, where it could be satisfactorily installed.

A member of the Society writes on the subject of the paper and discussion: Most of the speakers described "concealed" or "indirect" lighting as applied to the lecture theatre of the Institution of Electrical Engineers, as "cold, cheerless, and unsatisfactory." During the reading of the paper, a large number of photographs were projected on to the screen giving specimens of "indirect" lighting in rooms, offices, &c. Most of these had the ceilings, walls, and in some cases the floors dead-white. Under such circumstances, it is the easiest matter imaginable to get the effects shown. But as a speaker pertinently remarked: "One has to take things as they are, and endeavour to illuminate the surroundings as they are found in every-day use, and adapt ourselves to generalities. Quite so! That is quite another matter from choosing the most favourable conditions, or to having a room prepared in such a manner that it reflects the light from all points. An effect similar to that produced in some of the photographs could be obtained by "over-exposure." It was a happy thought on the part of one member (Mr. W. J. Liberty) to suggest that it would be a very good object-lesson if the members could turn for a time from the plethora of photographs that were being exhibited, and have the lights in the hall switched off to enable the members to see the "real effect" of a sample of indirect lighting. In the adjoining lobby, there had been placed an "indirect fitting" similar to that described by the reader of the paper. The "bowl" or "dish" was quite opaque—the underside being completely dark. The ante-chamber has a white ceiling, but dark walls, with statuary similar to that shown in some of the photographs, but with dark objects on the working plane level—such as tables and forms covered with overcoats and hats, all of which were visible through the glass partition dividing the lobby from the hall. Accordingly, the hall was put in darkness. The audience turned their attention to the lobby, and for a couple of minutes had the opportunity of viewing the effect of the indirect lighting there. What did they see? The ceiling brilliant beyond a doubt; the lower half of the room was admitted by members to be in gloom, was cold looking and unattractive, and absolutely useless for working purposes. It was felt that semi-indirect or even direct lighting softly shaded were far preferable to the indirect specimen. There was a very handsome semi-indirect gas-fitting in the room on exhibit by a gas company, having a translucent dish fitted with a cluster of incandescent gas-burners that was capable of giving all the good effects that could be claimed for any of the best forms of electric semi-indirect or direct lighting. Several photographic specimens of rooms thus lighted, showing a most pleasing appearance, were put upon the screen during the discussion. In my view, the writers of the paper treated their subject in far too narrow and biased a manner to inspire any large amount of confidence in the indirect method of indoor lighting. What is wanted is something more than "eye test" or "visual efficiency" set out in terms of figures, and that, as Mr. Mordey (I think it was) put it, is comfort in seeing and cheerfulness of the general surroundings.

THE FIRST KLÖNNE PLANT IN AMERICA.

A recent number of the "American Gaslight Journal" contained a communication furnishing particulars of the first installation of gas-oven plant on the Klönne system erected in the United States, and giving an account of the proceedings incidental to its adoption. The following are some extracts from the article; and they are supplementary to the information published in the "JOURNAL" for Oct. 1, p. 41.

After Herr Klönne, of Dortmund, had, as the result of extensive research and experiment, completed his system of chamber ovens, their advantages for gas making were recognized by Mr. James E. Stacey, the head of the Stacey Manufacturing Company of Cincinnati (Ohio): and he determined, if possible, to secure the rights for installing them in America. The result of his negotiations was that he obtained the exclusive patent rights of the system for the United States, Canada, and Mexico; and he then organized the National Chamber Oven Company, with headquarters in Cincinnati, for exploiting the process. About the same time, the owners of the Central Indiana Gas Company, who were supplying natural gas to a number of cities in Central Indiana, were confronted with the necessity of building ordinary plant to furnish gas to displace the then rapidly failing natural supply; and when the chamber oven system was brought to their attention, they at once realized how excellently it would meet their requirements. With the object of guarding against making an initial mistake, they commissioned Mr. Jos. C. Markley, their Managing Engineer, to investigate all the new processes in America and abroad. This resulted in the placing of an order with the Chamber Oven Company to construct at Muncie (Ind.) plant of an initial capacity of a million cubic feet per day, with provision for increasing it, from time to time, as called for.

After giving careful consideration to the requirements of the situation, with due regard to flexibility in output and economical operation, it was decided to instal two batteries of ovens, containing two ovens of four chambers each and one oven of three chambers—making six ovens with a total of 22 chambers. Each chamber was designed to take a charge of 5 (net) tons of coal, and to run on 24-hour charges. This makes the maximum capacity of the plant 110 tons of coal per 24 hours, or 10 per cent. in excess of the carbonizing capacity originally contemplated. Each oven is heated with twin generators, operating with a system of horizontal recuperators; the generator fuel being coke. The waste gases from all the recuperators are led into a horizontal flue under the foundations, and connected with the chimney. The damper system employed permits very close regulation of the primary and secondary air; and a master damper in the main flue ensures general regulation of the draughts, which are further carefully controlled by individual dampers at the connections of the recuperators to the main flue. Should the demand for gas be in

excess of the rated capacity of the ovens, the heats may be increased by proper operation of the dampers, so that the charge may be burnt off in 18 instead of 24 hours; and, if the demand is reduced, the heats may also be lowered and the carbonizing period extended to as much as 36 hours.

The coal storage in this plant is parallel with the operating floor; this space being excavated, and the entire storage being paved and the sides built up with the retaining walls. Two railroad tracks, built on trestles, extend the entire length of the coal-stores. The coal is received in dump cars; that which is intended for storage being unloaded in the main storage yard. The coal for current use is dropped from the cars into hoppers suspended under the railroad tracks, and is fed from these hoppers to a coal-conveyor under the floor, and extending at right angles with the tracks. The conveyor delivers the coal to the crusher, where it is broken into sizes not to exceed 1¼-inch cube; and it is then delivered from the crusher to an elevator conveyor, which delivers it into the elevated storage bin. The coal is discharged from the overhead bins into motor-driven lorries, which run over the charging nozzles of the ovens. The coal is accurately weighed on automatic registering scales, located immediately under the storage bins.

The general method of operation is as follows: In charging a chamber, the end doors are first closed; the coal being then discharged from the coal-lorries into the chambers through feeding-nozzles opening into the top of the chambers. The coal is levelled by means of a plough operated through an auxiliary opening at the "machine" end of the chamber. This plough is part of the coke-pusher to be described later.

In discharging, the stand-pipe of the chamber is first opened and the front and rear doors taken away. The door on the discharge (or coke) side is removed by a hand-power door-lifter, running on overhead tracks. The door is first released, then brought out from the face of the chambers a sufficient distance to clear the buck bars, and afterwards moved sidewise to clear the opening and permit the pushing of the coke. After the doors are removed, the pusher, which is motor driven, and the ram of which is of the "link" type, to minimize the clearance space required, is run into and through the chamber, pushing the whole of the coke out at the discharge end.

The hot coke falls on to an inclined quenching platform, provided with coke-valves at the lower end of the slope, through which the coke is discharged after being quenched by means of fire hose. The quenched coke is handled from the inclined coke floor through coke-valves into cars with side dumps. These cars are pushed by hand on to the coke elevator, from the shaft of which it may be placed into the furnace fuel-bin, dumped directly into cars for shipping, into the boiler-room for fuel purposes, or run through the crusher and screens, and deposited into the storage bins arranged for the various sized coke.

The doors at each end of the chambers are self-sealing, and are the first doors of this type to be successfully used in oven practice. In closing, they are handled by the mechanical door-lifters above referred to; the only manual labour in sealing the door to the frame being the turning of a hand wheel on the door.

Over the buildings from the rear of the boiler-house rises a tower. It is the naphthalene cooler condenser, through which the gas passes when flowing from the hydraulic main to the exhausters. This is fitted with bye-passes, so that one-third, two-thirds, or the entire shell may be utilized—thus ensuring wide flexibility for any difference in make or in weather conditions. The exhausters, which are in duplicate, are mounted on an elevated floor giving free access to all connections, drains, &c., beneath. Located in the exhauster building are the compressors, also in duplicate, for pumping the gas to the surrounding cities and towns supplied from the plant. The boiler capacity is ample for dealing with the operation of the entire plant, including the heating of the buildings and the gasholder tank and cups—leaving one unit in reserve for emergencies. The condensers and washer-coolers located in the apparatus building were especially designed for this plant; the washer-coolers being of the bell-type, with a high degree of efficiency. This apparatus is all built on a superstructure leaving free head-room beneath all machinery and connections, and is so designed that, by installing an additional washer and condenser, the capacity will be increased to more than 2 million cubic feet per day. The purifiers are of the duplex type, built of steel. They are 25 feet in diameter and 12 feet in depth. The gas enters at the centre of the box and passes up and down through the oxide to a common outlet duct.

The station meter is 9 feet diameter, fitted with a Hinman drum. The gasholder is a three-lift one, with steel tank, of 500,000 cubic feet capacity; and similar holders are located at Anderson and Marion, with a 400,000 cubic feet steel tank holder already erected at Elwood.

The writer of the article says too much emphasis cannot be placed on the small amount of labour necessary to operate the manufacturing plant. At present a considerable amount of auxiliary labour is employed in completing details of constructions, &c.; but a conservative estimate indicates that, including the works superintendent and chemist, the total number of men employed about the plant for each 24 hours, for all purposes, including the coal and coke handling, will not exceed twelve. The operating results thus far obtained indicate that the plant will, when running under normal conditions, produce 100,000 cubic feet of gas per day per man of the total number now employed by the undertaking.

DETECTING LEAKS IN AN INTAKE-PIPE.

Holes in the intake pipe-line of the Citizens Water-Works Company supplying water to Quincy (Ill.) were discovered by observing that the time, which is proportional to the velocity, between the entrance of a coloured solution at the crib and its exit at the well was twice as much as it should be theoretically. Particulars furnished by "Engineering Record" show that water is obtained from the Mississippi River through a 30-inch wood-stave pipe, 1540 feet long, laid diagonally out into the river and upstream. The low-service pumps take water from a well on the river bank adjoining the pump-house. The well is 15 feet in diameter, and extends to solid rock, 6 feet below the low-water mark in the river. Water flows to it by gravity when the pumps are running. There is a Coffin sluice-gate on the well end of the pipe, while the river end is protected by a wooden crib which is weighted-down and held in place by a considerable amount of rock. In order to keep the sand from filling the pipe, the end lying in the crib was plugged, and a hole 30 inches diameter was cut in the top of the pipe. Over this hole a short piece of 30-inch pipe, made of boiler steel, was fitted to the curve of the pipe, and fastened down with lag-screws. The top of this upright pipe is 2 ft. 8 in. below low-water mark.

Last February, Mr. C. A. Jennings, of Chicago, made an investigation of, and a report upon, the Quincy water supply. While carrying out his investigation, he also tested the condition of the intake-pipe in question. One gallon of a very strong methylene-blue solution was poured, by means of a piece of gas-pipe and a funnel, into the upright steel pipe at the outer end of the intake line. At the same time a signal was passed to a man stationed at the intake well, who noted the time which elapsed before the blue solution appeared in the well. At the end of 37 minutes, the colour was quite distinct. The test was repeated the next day with the sluice-gate closed sufficiently to lower the level of the water in the well to the top of the pipe, where it extended into the well. The colour was detected the instant it entered the well; the interval of time being reduced to 35 minutes.

While these tests were being made, the low-service pump was running at a speed which should have drawn the blue solution into the well at the end of about 17½ minutes. It seemed evident, therefore, that a large percentage of the water received into the well was coming through leaks between the intake crib and the well. As one of the main trunk city sewers discharges into the river above the well, it was very important that this leakage should be located.

After the ice moved out of the river, a diver was employed, and a careful inspection made of the entire pipe. At a point 402 feet from the well, the end of one of the staves was found broken out; leaving a hole 4 in. by 2½ in. This hole was closed by fastening over it with lag-screws a piece of boiler plate rolled to the outside diameter of the pipe. At a point 340 feet from the well, the pipe was found in a crushed condition, as if an ice gorge had rested upon it. This damage was repaired by lag-screwing curved boiler plates over the entire top of the pipe, drawing the staves tightly against the plates, and wrapping the entire pipe with log chains drawn up with long screw-threaded bolts. It required a patch 17 ft. 6 in. long at this point. No other leaks were discovered. After the repair work was done, the same test used by Mr. Jennings was repeated, with the result that the blue solution appeared in the well 12 minutes after it had been poured in. The pump operated at the same speed as during the previous tests.

This intake-pipe was laid in 1887. It is made of 3-inch yellow pine staves held together with ½-inch round iron bands. The diver who made the inspection and repairs reported the condition of the wood and iron as excellent.

Institution of Civil Engineers.—At to-night's meeting of the Institution, the paper to be submitted for discussion will be entitled: "The Generation and Distribution of Producer Gas in South Staffordshire," by Mr. H. A. Humphrey, M.Inst.C.E.

Test Deflections in Reinforced Concrete.—This was the subject of a paper read by Mr. Percy J. Waldram at the meeting of the Society of Engineers on Monday last week. The author remarked that the subject was one which required the closest attention of engineers before a standard of deflection was fixed by the proposed London County Council regulations—a standard which might or might not be correct or even safe. He said the stiffness of a beam was no criterion of its strength, unless due regard were paid to the factors of depth and fibre stiffness. The small deflections of reinforced concrete beams were sometimes quoted as evidence of the strength of the material; but it was seldom noted that the deflections were small, because the greatest loads placed on reinforced concrete were very much less than those commonly used on either wood or steel. Reinforced concrete was a much weaker material than steel or ordinary fir for beams of equal size. Reference was made to the calculations necessary to determine the strength of reinforced concrete beams; and a number of formulæ were given, with explanatory notes. The application of these to well-known tests was shown by a series of eight diagrams, and particular attention was directed to one in which the conditions were such as were generally supposed to make the calculations almost impossible, on account of their intricacy. By the author's method, however, the problem was shown to be facilitated.

REGISTER OF PATENTS.

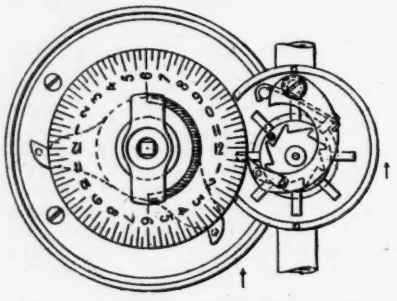
Lighting and Extinguishing Lights at Predetermined Times.

GUNNING, J., of Bournemouth.

No. 24,707; Nov. 7, 1911.

In patents No. 25,567 of 1899, and No. 8862 of 1908, the inventor has described means of lighting and extinguishing lights at predetermined times by a clockwork movement. But, as he remarks, it sometimes happens that the plug of the tap which, when made to run quite easily, gets shaken by the traffic, also, when the plug is turned by the weighted or spring-urged lever, as described, it overturns; on the other hand, if the plug is slightly tight, it does not turn by the fall of the lever or force of the spring. The present improvement consists of means of overcoming these defects.

On the plug of the stopcock, as described in the earlier patents, a spur-wheel and ratchet-wheel are fixed, both of which are operated by the tappets on the revolving time-disc. When the tappet comes round, it engages in the spur-wheel and turns it slightly. It also lifts a weighted, or forces back a spring-urged pawl, lever, which engages with the ratchet-wheel; and at the right time the weighted lever or spring-urged pawl lever is released, and the plug is turned instantly to its proper position. The tappet, being of the desired thickness, and being still between the two spurs of the spur-wheel, acts as a stop to the plug being over-turned; but should the plug from any cause become tight, and not have instantly moved by the weight or spring-urged lever, then the tappet again forces on the spur-wheel by the force of the clock. The ratchet-wheel may also be held in position by having a slight spring, either bearing on the pawl or on two of its teeth.



Gunning's Lamp Lighter and Extinguisher.

Another means of overcoming the defect mentioned that the present improvement consists of is to provide a spring-urged ball to fit between the spurs of the spur-wheel, so that when the tappet turns the spur-wheel, one of the spurs presses back the ball, and the moment the spur is urged by the tappet over the centre of the circumference of the ball, the spring presses the ball forward, which gives the spur-wheel an instant forward movement.

The illustration shows an elevation of apparatus embodying the invention with the cover-plate of the clockwork mechanism removed.

The invention may be applied to gas-control apparatus in which the tap is adapted to control more than one light or sets of lights, as, for example, to the case in which two lights or groups of lights are turned on at a predetermined time and turned off successively at different times; or it may be arranged to turn on a light or group of lights during certain hours, and the same or another light or group of lights during other hours within each 24-hour period—the arrangement necessary for effecting these various results being well known. The actuation also of the gas-tap by means of a weighted or spring-urged lever carrying a pawl which engages with a ratchet-wheel on the gas-tap is well known, the patentee points out.

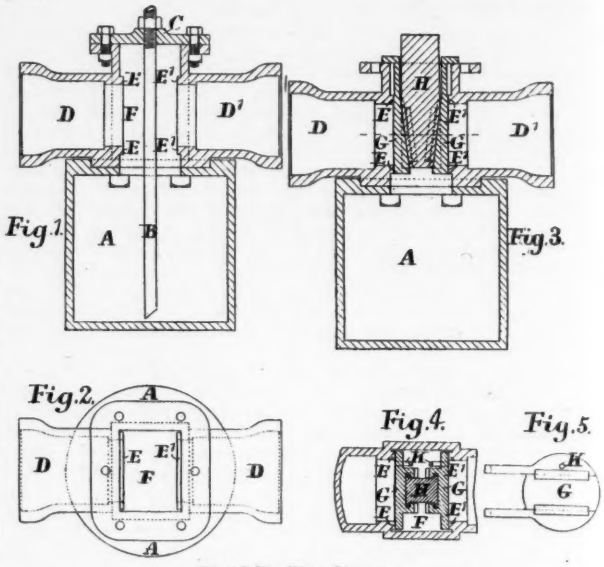
Stoppers for Gas Piping.

WADDELL, A., of Dunfermline.

No. 5184; March 1, 1912.

In the distribution of gas, the patentee remarks, it is usual to provide means for enabling sections of the piping to be tested, for trapping, at intervals, water that may get into or form within the piping, and for its removal. At suitable places throughout the piping, there are provided boxes, placed so that water getting into the piping from any source will fill these boxes before offering any obstruction to the flow of gas. According to his invention, each box has the sections of gas piping continued on to the top of the box, where the ends of the sections pass through to the inside of a chamber which closely surrounds them. These pipe-ends, which receive the stoppers described, are only such a distance from each other as to admit of the insertion of the stoppers, or running of water from the piping to the box below. The chamber has a removable cover to an opening on the top, to facilitate surrounding the sealed ends with water, and for inspecting the water; while the piping has air or gas under pressure within it, when a small leak past stoppers "could readily be seen bubbling through the water." The chamber is open at the bottom to the box, so as to allow the water formed, or getting within the piping, to flow into the box below. The water is removed from the box as usual through a small suction pipe reaching near the surface of the road.

The portable stoppers are preferably disc-like in shape on the face, and suitably mounted in pairs, with a right-and-left-hand screw, or a wedge, or other means between their backs to draw them nearer to one another, in order to facilitate placing them in their position and for forcing them against the pipe-ends to stop the flow of gas or air when testing. A small pipe through the stoppers communicates when necessary between the piping and the atmosphere, so that gas or air can be passed from piping to piping, or between the piping and the atmosphere.



Waddell's Pipe-Stopper.

Fig. 1 is a sectional elevation, having a small suction pipe B mounted on the removable cover. Fig. 2 is a plan with the cover and small suction pipe removed. Fig. 3 is a sectional elevation with the cover and small suction pipe removed and the stoppers in position. Fig. 4 is a horizontal section, showing a chamber with pipe-ends, and stoppers with wedge. Fig. 5 is a view of the back of a stopper from between the stoppers, with the wedge removed.

In figs. 1 and 3, A is the box to receive the water gathering in the piping or from any source. In fig. 1, B is a small suction pipe through which water is removed from A. C is a removable cover, and supports the pipe B. In figs 1 and 3, D and D^1 are socket pipe joints; while E E^1 are the pipe-ends surrounded by the chamber F, which has an opening to the box A. In figs. 3, 4, and 5, G are the stoppers and H the wedge; the stoppers being slidably mounted on the wedge. K are small pipes to communicate from section to section of the piping stoppered, or between the sections stoppered and the atmosphere.

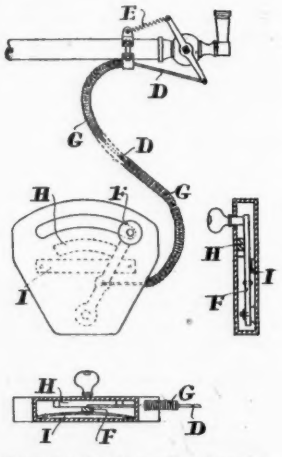
Fig. 1 shows the position of the parts of the apparatus when passing gas, with the box A to receive water from within the piping, and the small suction pipe B through which to withdraw it. Figs. 3 and 4 show the position of the parts prepared to make a test of the piping.

Operating Gas-Lamp Valves from a Distance.

GLIMPEL, R. & G., of Berlin.

No. 1452; Jan. 18, 1912.

This means for operating gas-valves for gas-lamps is of the kind in which a switch lever is connected with the valve by a cord within a flexible pipe; the novelty consisting in that the gas-valve is provided with a fixed double-armed lever, which at one end is connected with the cord, while its other end is acted upon by a spring, hereinafter described.



Glimpel's Gas-Lamp Tap Operator.

On the plug of the valve a double-armed lever is keyed, the lower end of which is connected with a pull-cord D, and the other end with a strong spiral spring E attached to the gas piping. The cord D is led through a flexible metal pipe G to the switch lever F arranged at a distant place from the valve, and from which the cord can thus be pulled. The lever F can be arrested in its end positions by an abutment-ledge

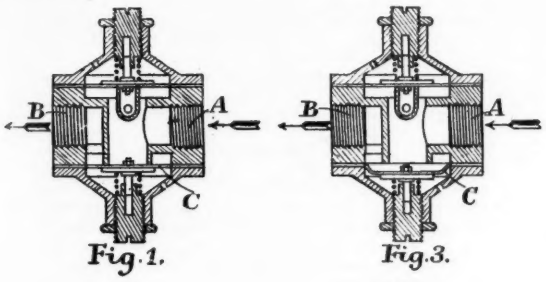
H and a blade spring I. By reversing the lever from the right to the left position the cord is pulled, and thus the valve is opened; the spring being thereby tensioned. When turning the lever back into its right position (as shown), the lever of the valve is pulled back by the tensioned spring E, and thus the valve is again closed.

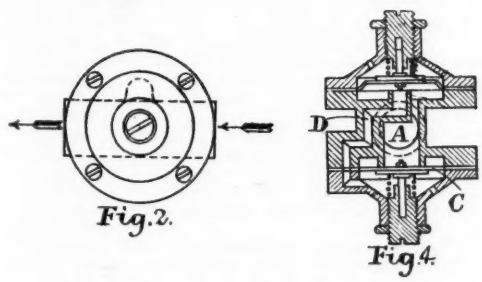
Gas or Air Conduit Controlling Devices.

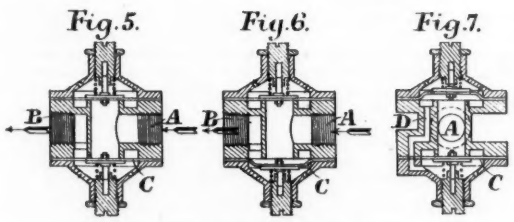
DEUTSCHE GASGLÜHLICHT AKTIENGESELLSCHAFT (AUERGESELLSCHAFT), of Berlin.

No. 4132; Feb. 19, 1912. Convention date, Feb. 18, 1911.

The present invention relates more particularly to controlling devices wherein the working pressure, which is higher than that obtained when the system is at rest, is adapted to maintain a supply valve in an open position, and wherein a higher pressure wave is admitted to the other side of the supply valve in order to close it. The subject of the invention is therefore devised for conduit systems in which there are three pressure stages.







A Berlin Gas Controlling Device.

The first illustrations show one form of the device. Figs. 1 and 3 are vertical sections of the membranes when the device is at rest, and when subjected to working pressure; fig. 2 is a plan of fig. 1, and fig. 4 a transverse vertical section of figs. 1 and 3, but showing the position of the membranes when subjected to a pressure-wave of higher intensity than the working pressure.

The passage from the inlet A to the outlet B is closed in the position of rest (fig. 1) by a membrane C, which is pressed by a spring against the valve-seat. The pressure of the spring is arranged to be overcome by the working pressure; so that the membrane is removed from the valve-seat (fig. 3) and air allowed to pass to the outlet. When the working pressure is increased, the membrane, which is acted upon by a spring above, is raised from the valve-seat (fig. 4), and the air passes through the branch passage D to the rear side of the membrane, which, being thus subjected on both sides to the same air pressure, is forced against the valve-seat by means of the spring below, and thereby closes the air-passage to the outlet. If the higher pressure is later completely reduced, the membrane returns to its position of rest, and the same operation may be repeated.

Figs. 5, 6, and 7 illustrate a construction which differs from that just described only by the special formation of the valve-seat. In the position of rest, the area of the membrane subject to pressure is smaller than in the working position; and the controlling device may therefore be operated by a temporary increase of the working pressure. At low pressure, the working-pressure membrane C closes (under the influence of the lower spring) the passage to the outlet; but under the action of the working pressure the membrane is lifted from its seat, and the passage to the outlet is opened (fig. 6). If a pressure-wave exceeding the working pressure is produced, the pressure-wave membrane is lifted from its seat so that the air pressure passes through the branch passage D to the opposite side of the working-pressure membrane, which latter, owing to the air pressure acting on both sides, is pressed, by the action of the lower spring, against its valve-seat and closes the outlet passage (fig. 7). When the pressure-wave drops to the normal working pressure, the membrane remains in its open position—due to the fact that the pressure area of the membrane has been increased by the lifting of it, so that the total pressure acting upon the membrane from below is sufficient to overcome the pressure of the spring. This has the result that, although the pressure-wave has dropped to normal working pressure, the passage through the upper device remains closed, and the apparatus connected to the conduit system may continue to work under working pressure. Only after the pressure in the conduit system has been reduced under normal working pressure will the membrane return to its position of rest.

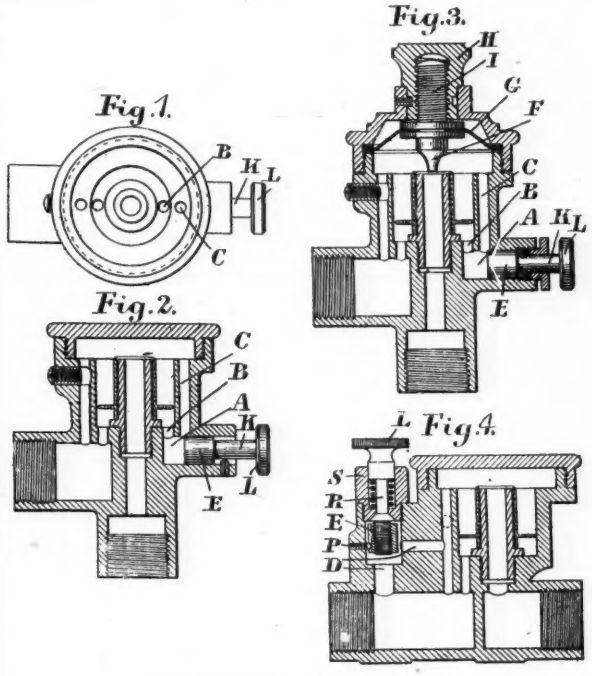
The construction last described may be applied to a lighting system in which the lamps are worked with pressure air. Heretofore, ordinary switches were used in connection with such systems which, upon the normal working pressure being set up in the conduit system, open the gas admission to the lamps, and, on stopping the working pressure, close the admission of gas to the lamps. If it was desired to extinguish at midnight one lamp after the other, this had to be effected by operating each lamp cock by hand. By the application of the switch according to figs. 5 to 7, one lamp after the other may be cut out from the central station, if the air-pipe of the lamps which are to be extinguished at midnight is provided with the controlling device shown in figs. 5 to 7. If it be only desired to extinguish a certain number of lamps, the lamps which are not to be extinguished by the high-pressure wave are provided with one of the ordinary switches, which, upon working pressure being admitted to the air-pipe, opens the gas admission, and upon reduction of the pressure in the air-pipe closes the gas admission.

Gas-Regulators.

GLOVER, T., of Edmonton, and WILLIAMS, G. A., of Kingsland, N.E.

No. 3307; Feb. 9, 1912.

This invention relates to the class of gas regulator or governor described in patent No. 7651 of 1910, and consists in providing such a governor with means whereby the amount of gas passing through it can be determined without interfering with the ordinary tap on the supply pipe.



Glover and Williams' Gas-Regulators.

In the first construction shown, there is provided an additional passage A opening at B into the cavity below the disc and opening at C into the chamber above the cavity on the top side of the floating disc. Alternatively, a second entrance D is made from the inlet to the ordinary passage, and this is controlled by a valve E capable of being actuated by hand so that when the valve is open the supply of gas from under the floating disc will in the one case pass through B to the auxiliary passage A, and then by C to the top of the floating disc, and in the other case the inlet gas will pass to both sides of the floating disc—"thus establishing full supply and perfect regulation by the floating disc." But to reduce the quantity of gas passing through, the valve E is screwed to close the entrance to the auxiliary A, or to close the additional inlet D to the ordinary passage, so that the gas will only pass up one passage to the top of the float and through another passage to under the float.

To suit varying pressures of gas, a movable valve-seating F [see fig. 2] is provided, preferably fitted to a diaphragm G secured to the top of the chamber by a cover with a screw-nut H engaging a screw I on the valve-seating F, and capable of being actuated from outside for moving the screw I for determining the position of the valve-seating F to suit the travel of the tubular sleeve and floating disc.

In fig. 2, the valve E (of the push kind) is provided with a stem K and knob L, and is held in the passage A by a screw; but in fig. 3, the valve is of the same construction, but held in position by a gland secured to the passage A.

In fig. 4, the valve E consists of an internally screw-threaded tube having a slot for riding up and down a pin P—the screw thread being engaged by a screw-threaded rod of a stem R positioned in a box S and

controlled by a spring, so that by turning a button the valve E can be actuated to close the opening D.

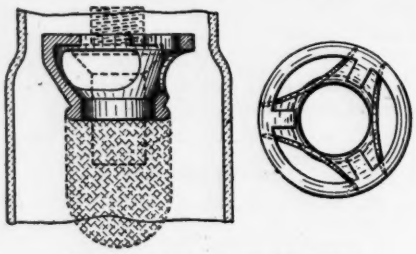
As already explained, when the valves E are closed the gas passes to either side of the float, as in the earlier patent; but when the valve is open in addition, the gas in figs. 2 and 3 will pass from under the float into the passage A and out at C; while at fig. 4 the gas will also pass through the opening D and away to both sides of the float.

Inverted Incandescent Gas-Mantles.

MÜCKE, J., of Berlin.

No. 7099; March 22, 1912.

This invention relates more particularly to the formation of the carrier or ring of inverted mantles specially adapted for Graetzin burners.



Mucke's Inverted Gas Mantle Holder.

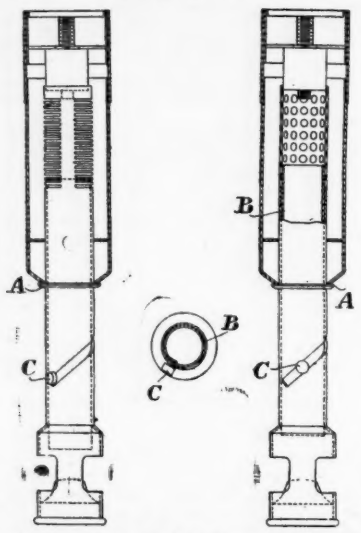
As shown, the carrier to which the mantle is secured has the form of a truncated cone. Its base is formed by an externally smooth unbroken ring, provided with inwardly radiating lugs of the usual construction for its suspension from the burner. There is a space between the base of the carrier and the globe, and there are recesses or perforations in the conical body of the carrier, so that the hot gases are free to pass between the lugs and the burner, while the fresh air can freely flow through the clear space between the base and the globe body—"thus efficiently cooling the glass and counteracting its melting."

Incandescent Gas-Burners.

SPARKS, E., of Tufnell Park, N.

No. 11,103; May 10, 1912.

This invention relates to an incandescent gas-burner "in which compensation for differences in the richness and pressure of gas supplies is obtained by more or less covering slots formed in a tube conveying the gaseous mixture, and thereby varying the effective length of the tube."



Sparks' Adjustable Upright Incandescent Burner.

The bunsen tube of the upright incandescent burner shown has its head supported in position by means of a flange A formed on the tube. The tube is provided below its closed upper end with a suitable number of openings through which the gaseous mixture can pass into the burner-head. These openings may take the form of slots or of circular holes, as shown in the two sections. B is a tube which closely fits the interior of the bunsen tube, and is adapted to be moved up and down (by suitable means operated from the outside of the burner) so as to more or less cover the slots or openings, and so obstruct or facilitate the flow of gaseous mixture into the burner-head. The device for raising and lowering the tube B preferably consists of a pin C fixed to the tube and moving in a helical slot formed in the bunsen tube.

Electric Light Culvert Explosion at Hove.—While some workmen from the Hove Electric Lighting Company, Limited, were engaged in localizing an escape of gas which had accumulated in a culvert, the gas was ignited by a spark, and an explosion followed. For a distance of about 50 yards the concrete pavement was displaced, and in an area of 3 yards it was reduced to atoms. One of the Company's servants who was at work at an inspection chamber some yards off had his face badly burnt; and two others were slightly injured.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Projected Gas Exhibition at Antwerp.

Sir,—I should be much obliged if you would kindly make known to your readers, in the "JOURNAL," that it is proposed to hold an exhibition of gas appliances for lighting, heating, cooking, &c., in Antwerp from about the 22nd of February to the 25th of March next. The exhibition will be under the patronage of the Minister of Public Works, the Governor of the Province of Antwerp, and several of the authorities of the town, both civil and military. A local Committee, under the auspices of the Antwerp Gas Company, has been formed in order to make the necessary arrangements.

There is in Antwerp, in my opinion, a great field for enterprise in bringing to the notice of the inhabitants of the commercial metropolis of Belgium the many advantages to be gained by the use of modern gas appliances for all purposes. There has never been an exhibition of the kind before in this City, and I therefore anticipate a great success, and would strongly advise the manufacturers of such appliances in your country to participate in it.

All particulars can be obtained from the Executive Committee at our offices, 58, Place de Meir, Antwerp.

A. F. P. HAYMAN.

Imperial Continental Gas Association, Antwerp, Nov. 29, 1912.

Coal Stacking and Fires.

Sir,—With reference to Mr. Kendrick's valuable paper, read before the Manchester District Institution of Gas Engineers on Saturday, the 30th ult., perhaps it may not be considered out of place to offer a few remarks which I had intended making at the meeting, but, owing to the interesting programme kindly arranged by the President (Mr. Samuel Glover), time did not permit.

In stacking, it might be found practicable in some cases to cover the face of a stack to the depth of a few inches with coke dust, and then pour molten pitch on the top of it—thereby excluding the air. The stack would require coating all over; otherwise a draught might be created. A further advantage would be that oxidation would be prevented by the exclusion of the air. Of course, if the stack could be hermetically sealed, there would not be any possibility of a fire. The oxidation which the oxygen of the air sealed with the coal would allow would be limited to a very small amount indeed; and when this oxygen was exhausted, the coal would be practically stored in an inert gas—*i.e.*, nitrogen.

There has not been an opportunity for sealing the coal stacks here, as suggested; but probably some of your readers may have tried some such system.

During the discussion upon the paper, Mr. Shadbolt referred to the digging out of a ball of fire, and thereby promptly stopping the outbreak. But in other cases where the fire had travelled through a stratum of coal, any attempt at digging was useless. Precisely the same has been experienced at the Huddersfield works; and it is most interesting to find a corroboration thereof.

EDWARD A. HARMAN.

Huddersfield, Dec. 6, 1912.

Carbonization in Vertical Retorts.

Sir,—I am so sorry my letter upset Mr. Settle; but if he had made himself better acquainted with the substance of it, he would surely not have written such a letter. As it is, he has penned so distorted a view, that I cannot allow it to pass unchallenged.

Mr. Settle graciously grants me the right to my own opinion, which indeed is opportune, as it allows me to say that his invention No. 12,552 of 1902 (of which I had full knowledge) does not anticipate in the slightest degree my invention No. 19,437 of 1908; and as regards the merits of his invention, these are best known to himself.

The elements of our respective patents are:

SETTLE, No. 12,552 of 1902.	TOOGOOD, No. 19,437 of 1908.
A mode of carbonizing coal in vertical retorts, consisting in maintaining a *continuous layer* of coal on top of the charge, so that the evolved gases *do not pass through the charge*.	A method of charging *intermittent* vertical retorts to facilitate the passage of gas *through the charge*.

Hence the patents are in direct opposition, which fact even Mr. Settle's fertile imagination cannot alter, though he may quote and misquote until he is tired.

To conclude, Mr. Settle ludicrously exhorts me to be just, while he himself, in a most amazing manner, endeavours to hide the truth.

H. J. TOOGOOD.

Elland, Dec. 6, 1912.

Sleepy-Headed Gas Companies.

Sir,—The "Editorial Note" in your issue of the 26th ult, under the above heading, is interesting; and it is refreshing to know that really one gas company can be found which will not conform to your "ubiquitous builder's" stereotyped views of business methods, which appear to be that gas companies should equip his houses free of charge with essentials necessary to effecting a ready and profitable sale (or lease) of his property, and that the companies are to incur this outlay on purely a speculative chance—the odds against them being that their pipes will be rendered useless by the electricians, who follow after, and cut and otherwise damage the gas-pipes as much as possible.

I am acquainted with the methods of many gas companies on the fringe of London, and do not know one whose business is conducted on "farm tumbrel" lines. There are some whose head officials are so closely in touch with the details of their responsibilities that some builders'

ideas of "business methods" are checked, with the result that it is not so easy for the company's subordinate officials to become popular with the builders, as it is for their chiefs to become unpopular with them, in doing justice to their boards and shareholders.

Some one has well said that "to become popular is an easy thing; but to do unpopular justice—that requires a man."

I wonder if your informant is one of the class of builders who, after their houses have been piped free of charge by the gas company, have them wired for electricity, during which process the drop-pieces are pulled out of the ceilings and the points on the walls turned in, and every trace of same plastered-over flush. If so, it would be a salutary lesson for him just to run his "motor-car" up against even a "farm tumbrel" of justice; it would make him stop and think. Whatever it may be that has got in the way of his fast driving, do you think it ought to have blinded him to the fact that, instead of vilifying the gas company in private, he should have appealed to its directors in public; and do you not think he would have found that, though in the minority of the gas industry, they could have given him some clear and defined reasons for differing from the majority?

Would it be wrong to assume that this revolution in the gas industry has gained such momentum that those in the vortex are unable to help themselves; and that therefore it behoves those who are outside to steer a safe (and profitable) course? At the same time, if this minority find that it will be to their advantage to give a pound of tea to every new "slot consumer," and theatre tickets to every new "ordinary consumer" coming into their district, is it not reasonable to think they ought to do so—more especially as gas companies are now considered analogous to "butchers providing their customers with ready-made families?"

As a humble servant of a London gas company, I feel very self-satisfied that your indictment does not cover the ground of my long associations. But I wonder if the servants of the gas company under your unfavourable notice do not pity us poor London gas companies' employees being bullied, threatened, and (metaphorically speaking) seized by the scruff of the neck and kicked by builders and other public tyrants, who demand to be served with everything free in the way of gas appliances, on the principle that such backsheesh is up-to-date "business methods," and which doubtless that so-called sleepy company would say went out of date with the extinction of the ancient Athenian democracy.

Dec. 4, 1912. ULTRONEOUS.

The "Eticoal Syndicate" Process.

SIR,—I notice in your issue of Dec. 3 a *résumé* of the pamphlet issued by this Syndicate in the matter of "Coalite."

I want to thank you for the eminently fair way in which you have gone into the matter, and the perfectly justified criticism you have made in reference to it.

In regard to the Syndicate not overlooking the changed character of gas-works tar under the new system of carbonization, we quite appreciate that we are both approaching more nearly to the ideal position than heretofore, and that there is very little difference, except possibly in volume, in the two products.

In regard to the patents, naturally, no one is in a position to judge until the matter has been decided judicially. But we are advised by Counsel that we have a perfectly clear position; and until results prove otherwise, we must maintain that attitude.

Again thanking you for the very fair and courteous manner in which you have dealt with the matter,

For the ETICOAL SYNDICATE, LIMITED,
HERMAN CLARKE, Managing-Director.

2, *Austin Friars, E.C., Dec.* 4, 1912.

Gas Coming by its Own.

SIR,—In an article in the "Lady's World" Christmas Double Number, under "Housecraft, by an Ingenious Flat-Dweller," is an interesting paragraph headed "Gas an Important Factor," a copy of which I enclose.

It so seldom happens that anything complimentary of gas is mentioned in any of these domestic papers, that one would almost think the efforts of the British Commercial Gas Association are beginning to be felt. At all events, I thought I would call your attention to the paragraph, thinking you might possibly care to give it as indicating the direction of the current.

Huddersfield, Dec. 7, 1912. EDWARD A. HARMAN,
Engineer and Manager.

[ENCLOSURE.]

GAS AN IMPORTANT FACTOR.

The main factor in any scheme of simplified housekeeping is unquestionably the substitution of gas for coal, not only for cooking and ordinary fires, but also for heating water. The gas circulator for heating water in this case occupied but small space in the scullery, where it was connected to the "flow" and "return" pipes from the dining-room range boiler, without in any way interfering with the working of the latter when the dining-room fire was in use. And as the tiniest flame burning all night served to ensure an abundance of hot water for morning baths and other purposes, the consumption of gas is not excessive, neither is the cost of installing this ingenious system at all ruinous.

Carbonization in Vertical Retorts.

SIR,—Your correspondent, "Consistency," in his remarks on "How the Dessau System of Intermittent Vertical Retorts is Worked," touches on controversial points, which, in the interests of the gas profession, should be ventilated.

The Dessau process we have been told consists in so charging a tapered vertical retort that there is no space intentionally left for the gas or tar—subjecting such a charge to an abnormally great heat, so that the coke is formed sufficiently compact as to be impermeable to gas, whereby the gas and tar are forced inward and upward through the cool centre of the charge.

"Consistency" says that, speaking with full knowledge of months of experience, he so charges his Dessau retorts that free spaces are formed in the charge, and a less dense coke is produced, with a more ready exit of the evolved gases. Hence it might be logically deduced that his coke is not impermeable to the gas. Therefore he is not using great heats; and his gas does not go inwards and upwards. In fact, though he might be using Dessau plant, he cannot be using the alleged Dessau patented process.

I trust "Consistency" will live up to his *nom-de-plume*, and satisfactorily explain these apparent inconsistencies.

Elland, Dec. 4, 1912. H. J. TOOGOOD.

LEGAL INTELLIGENCE.

Sequel to the Lisburn Gas-Works Purchase.

In the King's Bench Division of the High Court of Justice in Ireland, an application was made last week, on behalf of the Lisburn Urban District Council, to have set aside a judgment in favour of the Lisburn Gas Company, Limited, for a sum of £77 1s., and to have judgment entered in favour of the Council on a counterclaim for £6 11s. 11d. The action had been tried at the Belfast Assizes by Mr. Justice Dodd, and a report was given in the "JOURNAL" for the 6th of August last (p. 401). The Company were the vendors of the gas-works, and the Council were the purchasers under a Special Act; and the question for the Court was as to whether two items charged were "outgoings," and whether, if they were, they were apportionable under the Act. After argument, which showed that the claim in the action was for £306 18s., the Court set aside the judgment for the Company, and entered it for the Council, with costs, both on the claim and counterclaim.

Liability for Reinstatement after Pipe-Laying.

In the West London County Court last Tuesday, before Sir William Selfe and a Jury, Lily May Corio, an infant, brought an action, through her father as next friend, against the Brentford Gas Company and the Hammersmith Borough Council, to recover £50 damages for personal injuries. It appeared that in June last a trench had been opened by the Company in Aspen Place, Hammersmith, for the purpose of laying a pipe for the supply of gas to a cottage. The trench had been temporarily filled in by the Company's workmen; and the Hammersmith Borough Council's servants undertook to make good the surface permanently. On the 23rd of August, the child, while returning from school, put her foot into a hole, and fell against a wall; sustaining injuries about the face which required attendance at a hospital and medical treatment. The Company and the Council were joined as defendants; allegations being made of negligence in creating and allowing a nuisance in the thoroughfare. Mr. C. T. Williams appeared for the plaintiff. Mr. Ross Brown represented the defendants, and submitted that the Company were not liable, on the authority of the decision of Justices Kennedy and Bray in the case of *Cressy and Wife v. South Metropolitan Gas Company*, reported in the "JOURNAL" for May 29, 1906 (p. 590). His Honour accepted this contention, and entered judgment for the Company. On behalf of the Council, it was argued that there was no evidence of misfeasance to support the action. But his Honour left the question of negligence to the Jury, who found for the plaintiff, and awarded £10 damages as against the Council. Judgment was accordingly entered for the amount, with ordinary costs.

An Offer of High-Pressure Street Lighting at Maidstone.

The Highways Committee of the Maidstone Town Council have under consideration a letter from Mr. F. Livesey, the Engineer to the Gas Company, pointing out that as the Company have recently laid a high-pressure gas-main through the High Street, they are in a position to offer the Council the great advantage of high-pressure gas street lighting. The Company, he said, are prepared to supply and fix, free of cost to the Corporation, on the existing columns, eleven 1500-candle power high-pressure lamps in High Street and four similar lamps on Maidstone Bridge, and also fifteen 300-candle power low-pressure lamps for use after 11 p.m., keep the lamps in good order, extinguish the high-power lamps at 11 p.m. and light the low-power lamps, and extinguish the low-power lamps at extinguishing time in the morning, for the inclusive charge of £14 per lamp per annum, subject to a six years' agreement. Mr. Livesey added: "As I believe that this scheme would, if adopted, give a better light than the present one at an annual saving to the town of £90 per annum, I trust the Council will see their way to accept the offer."

Widnes Gas and Water-Works Extensions.—The Widnes Town Council will, at their meeting to-day, be asked to approve a recommendation of the Gas and Water Committee to carry out extensions of the two undertakings, at an estimated cost of £56,000. The gas extension scheme submitted by Mr. Isaac Carr, M.Inst.C.E., the Engineer, comprises much reconstruction in proportion to extension, and provides for the modernizing of the present carbonizing plant, and an installation of conveyors and elevators, and mechanical stokers. It is also proposed to enlarge the buildings, and to make storage room for 9000 tons of coal, compared with the present storage of 3000 tons. The cost of the gas extensions is reckoned at £36,000. It is claimed that there is an abnormal increase in the consumption of gas due to the demand of the numerous works in the district, owing to the prosperity of the chemical trade; and another contributory factor in respect of the future supply is that a large number of houses are shortly to be erected at Bold, near the collieries. As regards the water scheme, the cost of which will be £20,000, the principal item is the erection of a new engine at Stockswell pumping-station.

GAS AUTHORITIES AND RESIDUAL PRODUCTS.

JOINT COMMITTEE OF PARLIAMENT.—Tuesday, Dec. 3.

[*Before Mr.* HILLS (*Chairman*), *the Earl of* CRAVEN, *Lord* HOWARD DE WALDEN, *Lord* PLUNKET, *Lord* BRAYE, *Lord* INCHCAPE, *Mr.* LARDNER, *Mr.* WALTER REA, *Mr.* SAMUEL ROBERTS, *and Mr.* GEORGE THORNE.]

The Committee to-day resumed their inquiry (a report of the first three days' proceedings at which appeared in the "JOURNAL" last week, pp. 758-68).

The Counsel present were Mr. J. D. FITZGERALD, K.C., and Mr. LYNDEN MACASSEY, K.C., for the United Alkali Manufacturers' Association; and Mr. BALFOUR BROWNE, K.C., Mr. C. C. HUTCHINSON, K.C., and Mr. A. M. PADDON (instructed by Messrs. R. W. Cooper and Sons), for the Gas Companies' Protection Association, and also for the Association of Municipal Corporations.

A Suggestion from the Chairman.

The CHAIRMAN, at the commencement of the proceedings, said that the Committee had been appointed to inquire into what restrictions, if any, should be imposed upon gas companies. Mr. Fitzgerald had already replied to a question by the Committee, indicating that in the main, without pinning himself to the words, he asked for Lord Ritchie's clause; and he would suggest that before the evidence was closed, and before the Committee heard the speeches by Counsel, Mr. Fitzgerald should submit a form of clause showing exactly what he suggested the Committee should do, and in the same way Mr. Balfour Browne should either say that he asked for the Model Clause in the same form as it was in the Model Bill before the alteration of this year, or that he should submit a clause in such a form as he thought good. Then the Committee would have before them, in a concrete form, the exact requirements of both sides.

Mr. FITZGERALD said he certainly should have great pleasure in doing what the Chairman had suggested. At the same time, he pointed out that, so far as the Model Bill was concerned, it was for the authorities of the two Houses to frame this in such a form as they thought proper to carry out any decision which the Committee might arrive at. Under these circumstances, it might be a matter for the consideration of the Committee whether they should not lay down the principle, and leave the exact form of the clause to be determined by the authorities of the Houses. He should, however, certainly follow out what had been indicated from the Chair, and hand up a clause which would meet the desires of the alkali manufacturers.

Mr. BALFOUR BROWNE said that Mr. Fitzgerald was technically right that the Model Bill had to be framed by the authorities of the Houses. But this was a Joint Select Committee of both Houses of Parliament, and, as he understood it, the position was to lay down a principle that was to be followed in future with regard to gas companies and their residuals. At the same time, he did not think it would be at all the right thing that the Committee should merely state the principle and then leave the authorities of the Houses to modify it. Therefore, he hailed the Chairman's suggestion with gratitude, and would propose a clause which the Committee would, of course, reject or modify in any way. But once the Committee had done this, he hoped it would be binding on both Houses of Parliament.

Mr. FITZGERALD said he had not suggested that any principle laid down by the Committee should be modified. It was a question of how to carry it out.

The CHAIRMAN said he quite understood Counsel. The reason the Committee wanted to have a form of clause was in order to have in black and white exactly what each party asked Parliament to do.

Resumption of the Case for the Gas Undertakings.

Mr. BALFOUR BROWNE then proceeded with the case for the gas undertakings, but prior to calling further evidence, reverted to a request by the Chairman at an earlier stage of the proceedings that Mr. Corbet Woodall should prepare figures showing what the net cost of the residuals was in the case of the Gaslight and Coke Company. The table given below was then handed in; and, said Mr. Balfour Browne, it answered the Chairman's question.

The CHAIRMAN, after perusing the table, pointed out that, although this gave the Committee a good deal of information, he would have liked the figures in rather a simpler form. The table gave the total receipts; but it did not show how much of the working costs were to be debited against the receipts from residuals.

Mr. BALFOUR BROWNE said that if the Chairman wished to have the cost shown on the other side of the 9·58d., he did not know it would be possible, because the whole process of manufacturing gas was one.

The CHAIRMAN: But you must know the cost of each separate process, I should think.

Mr. BALFOUR BROWNE: We will try, and if we can we will supplement this table by the figure you want. I am afraid, however, that it will be impossible.

Further evidence on the general question was then called.

Mr. R. G. SHADBOLT'S EVIDENCE.

Mr. *R. G. Shadbolt*, the Engineer of the Grantham Gas Company, said he had no hesitation in confirming generally the previous evidence given on behalf of the gas undertakings. The proposal of the alkali manufacturers was universally objected to throughout the gas industry. The Council of the Institution of Gas Engineers saw the gravity of the situation, and took steps to ascertain to what extent the practice objected to was followed. The Institution represented the technical side of the gas industry, irrespective of whether the works were in the hands of municipalities or companies. With a view to laying information before the Committee, the Council of the Institution issued a circular, dated April 27, 1912, to all gas undertakings in the country, asking a number of questions pertinent to the subject. There were eight questions as follows:—

1.—Do you make up your gas liquor into sulphate of ammonia, or concentrate it?
2.—Do you make sulphuric acid?
3.—Do you distil your tar, or prepare it for road purposes?
4.—Do you purchase ammoniacal liquor, tar, or spent oxide from any other undertaking?
5.—Do you sell any of the alkali products to any other gas undertaking?
6.—If you sell your residuals to chemical manufacturers, is there any real competition for them?
7.—Have you any legal restrictions against (*a*) using up your own residuals; (*b*) buying residuals from other gas undertakings to be worked up with your own?
8.—If you have any other information that can be of assistance, please state it.

This circular was sent to 1600 undertakings; and up to the end of June, when the replies had been tabulated, 746 replies had been received from undertakings varying considerably in size. The replies represented 87·55 per cent. of the total output of the gas undertakings of the United Kingdom. To the first question, 372 replies were received to the effect that these undertakings worked up their liquor—353 of them into sulphate of ammonia, and 19 concentrated; the latter, of course, being potential purchasers of liquor from neighbouring gas-works. There were 76 undertakings which prepared or worked-up tar; and these were subdivided as follows: 217 distil tar, 12 dehydrate it for road purposes, and 43 prepare it for asphalt or other purposes for roads. Six of these undertakings stated they were putting down plant for dehydrating tar at the time the reply was sent. Most of the undertakings were thus able to render assistance in relieving other undertakings of their tar; and this ability to compete secured more or less normal prices from chemical manufacturers. As to the manufacture of sulphuric acid, the result of the census was that there were nine undertakings manufacturing acid. These, of course, were able to relieve others of their spent oxide, with the result that the prices of acid or spent oxide were kept near the normal. Of these nine, five were municipal—namely, Bradford, Coventry, Carlisle, Manchester, and Nottingham—the three London Companies and the Sheffield United Gas Company making up the total. Six of these nine concerns purchased spent oxide from other undertakings. The extent to which

The Gaslight and Coke Company, Year 1911.

—	£		Per 1000 Cubic Feet.		Percentage of Total Cost to Company (including Charge for Capital).	
Coal and working expenses	3,233,440	..	30·45	..	72·26	..
Special purposes fund	40,000	..	0·33	..	0·89	..
Writing down investments	(Net) 4,218	..	0·04	..	0·09	..
Total coal and working expenses		3,277,658		30·87		73·24
Charge for capital		1,197,174		11·27		26·76
Total cost to Company (including charge for capital)		4,474,832		42·14		100·00
Less receipts for residuals—						
Coke	615,412	..	5·79	..	13·75	..
Breeze	45,991	..	0·43	..	1·03	..
Tar and products	134,388	..	1·27	..	3·00	..
Ammoniacal liquor and sulphate	221,835	..	2·09	..	4·96	..
		1,017,626		9·58		22·74
		3,457,206		32·56		77·26
Less rents receivable, &c.		9,836		0·09		0·22
Say, net cost to Company (including charge for capital)		3,447,370		32·47		77·04
Net gas rental	3,165,832	..	29·81	..	70·75	..
Meter rental	135,964	..	1·28	..	3·04	..
Stove rental	114,308	..	1·08	..	2·55	..
Rental of fittings	132,325	..	1·25	..	2·96	..
		3,548,429		33·42		79·30
Surplus		£101,059		0·95		2·26

Nov. 28, 1912.

residual products were purchased by gas undertakings from other gas undertakings was shown by the fact that 61 replies were to the effect they purchased residual products—57 purchasing liquid products, and four relieving other works of their spent oxide. With regard to these 61 undertakings, a special effort was made to get full details. The Council of the Institution of Gas Engineers felt that the mere statement to the Committee that 61 undertakings said they purchased residual products from other undertakings might not be sufficient for the purposes of this inquiry; and although there were doubtless many others than those actually stated as purchasing residual products, it was felt by the Institution that if they were in a position to secure information, it would be best to confine themselves to the 61 who had volunteered to give such information. Therefore, a special letter was addressed to these 61 undertakings on July 19, asking for the character of the materials purchased, and their identity, both as to the nature of the materials and the undertakings from which the purchases were made. In reply to this letter, 46 undertakings expressed willingness to furnish the information asked for. The remainder demurred to give the information for use before the Committee, for fear that their interests, and those with whom they dealt, should suffer. Witness put in the table given on p. 838. The point witness wished to bring home was that there were 46 gas undertakings who were purchasing residual products from other gas undertakings, or who had purchased residual products in the past, and who were willing that the information should be placed before the Committee.

The CHAIRMAN pointed out that the list did not give the quantities purchased.

Witness said that the output in the last column was given as an indication of the magnitude of the operations.

The CHAIRMAN asked whether the Committee were to assume that practically the whole of the residuals were sold.

Witness thought this would be so in the majority of cases, although it was difficult to say precisely. Summarizing the table, he pointed out that it showed that at least 114 gas undertakings—either statutory, non-statutory, or private—are now selling, or at one time or another have sold, residual products to 46 undertakings. Of the 46 purchasing undertakings, the greater proportion had an annual output between 10,000,000 cubic feet and 500,000,000 cubic feet. Excluding two or three of the very largest undertakings who had occasionally done a small amount of intertrading, the bulk of the undertakings who either sold or who had at one time or another sold residual products to their neighbours, will be found to have annual outputs of gas considerably below 100,000,000 cubic feet per annum; the actual figures being as follows:—

Annual Output of Gas.	Undertakings Purchasing Residuals.	Undertakings Now Selling to Foregoing Buyers.	Undertakings that Have Sold to Foregoing Buyers.
Under 10 million	*Nil*	24	8
10 to 20 million	1	11	11
20 to 50 million	14	6	13
50 to 100 million	10	7	3
100 to 500 million	13	2	8
500 to 1000 million	4	0	3
Over 1000 million	4	2	7
Very small (outputs not known)	0	3	6

This summary showed that outside the effect of any material advantage that accrued to the gas undertakings purchasing residuals from works other than their own, there was the benefit and assistance it afforded to smaller undertakings in their neighbourhood. Witness expressed the opinion that even greater hardships would certainly fall upon the smaller undertakings than the larger ones, when a residual purchasing neighbour was debarred from dealing in residual products, and the smaller undertakings were thus at the mercy of the chemical manufacturers, and were often of an insufficient size to put down plant to work up their own residuals, or were so situated geographically as to render the residuals valueless by the time they reached the manufacturers' works. Then there were the non-statutory undertakings, against whom any restriction of the Committee would not apply to the full as with the statutory undertakings; but it would hurt them by depriving them of purchasers if statutory undertakings could not buy. It was a fallacy to say that non-statutory undertakings were mere traders and would not be affected. He knew of many cases in which, if they were deprived of the larger gas-works as purchasers of their products, the latter would have to be sold for unremunerative prices, or the liquor would have to be disposed of as best it could. Tar was more easily disposed of in the smaller works than the liquor, which became a nuisance if run into drains or streams. To illustrate this point, witness turned to Coventry, in the table already given. The Corporation were buying from a certain number of statutory and non-statutory undertakings, and obviously the latter would suffer if the Corporation were debarred from purchasing. The same applied to Derby and several other instances which witness picked out, and particularly so in cases where the smaller gas-works were far removed from an ordinary chemical manufacturing works. The following figures were given to illustrate the general effect upon statutory, non-statutory, and private gas undertakings if the restriction were imposed:

Undertakings Purchasing Residuals.		Undertakings now Selling Residuals to Foregoing Buyers.	Undertakings who have Sold to Foregoing Buyers.
Total	46	55	59
Statutory	41	29	38
Non-statutory	5	21	14
Private	—	5	7

Witness next dealt with the replies to the sixth question in the Institution of Gas Engineers' circular—namely, "If you sell your residuals to chemical manufacturers, is there any real competition for them?" The replies to this question were by far the most emphatic of all. Some 448 undertakings, or 60 per cent. of the whole, replied; and they all considered that there was very little actual competition for the products—the competition being reduced to a minimum by concerted action among the buyers. The replies with regard to parliamentary restrictions against working-up showed that there were four such cases—namely, Bath, Hornsey, Bedford, and another; and in all instances this was due to the residential amenities of the district. At the annual meeting of the Institution of Gas Engineers in June last, a resolution was proposed and carried unanimously as follows: "That this meeting is of opinion that the action of the alkali manufacturers in endeavouring to prevent unrestricted trade in the manufacture and sale of residual products arising from gas manufacture is opposed to the interests of gas consumers. It heartily approves of the action of the Council in bringing the matter before the authorities in Parliament, and is of opinion that every endeavour should be made to oppose any curtailment of the powers possessed by gas undertakings in dealing with their residuals." There was evidence in the replies, which indicated that an appreciable number of undertakings had under consideration the putting down of plant in order to work-up liquor; and if the restrictive clause proposed by the alkali manufacturers was persisted in, there was little doubt that the number now manufacturing sulphate of ammonia would be considerably augmented. The same thing applied to tar and other matters to a less degree; and this would all have a detrimental effect upon the chemical manufacturers themselves, as the supply of ammoniacal liquor from gas-works would be practically cut off for them. It had been said on the other side that small undertakings could easily put up a plant to deal with their ammoniacal liquor; but these plants would only be put up by the smaller undertakings in self-defence, because any such plant would necessarily have to be large enough to deal with the maximum output in winter time. This would involve a plant which could not be kept in continuous operation throughout the year. Many plants in small works were constantly idle for the greater part of their time; and not only was the capital unproductive, but the expense of maintaining the plant idle was much greater than when it was working. He confirmed the previous evidence that the supply of liquor from gas-works was a long way from being the only source available to chemical manufacturers, and handed in abstracts from a large number of Acts of Parliament from 1858 to 1911, which demonstrated that it was the consistent policy of Parliament to give gas undertakings the widest powers in dealing with their residual products. Among these might be mentioned Maidstone, 1858; Durham, 1873; and Shipley, 1870. In all cases the words "deal in" or "purchase" occurred. Finally, witness said that it was within his knowledge that many small undertakings actually wasted their liquor.

Mr. FITZGERALD, following his usual line of cross-examination, first obtained from witness information as to what his own gas-works were doing in the matter of residuals. Witness said that the Grantham Gas Company sold their liquor, tar, and spent oxide to chemical manufacturers, and did not purchase anything from any other gas company.

Mr. FITZGERALD: What, then, have you done to assist the small companies?

Witness: We have no small companies in the immediate neighbourhood, within a radius of five or ten miles.

In answer to further questions, witness said that he did not represent to the Committee that it was only within a radius of five or ten miles that it was possible to carry ammoniacal liquor economically; but there were no small gas undertakings within economical reach of Grantham. Although Grantham sold all its products, it was questionable whether it was more profitable to do this than to work them up. He thought he was on the border line; and the fact that he was in the position to put down a plant at any time was an important factor in enabling him to get reasonable prices. A long series of questions followed as to the economical limits within which ammoniacal liquor could be carried from a gas-works; and eventually Counsel obtained the opinion from witness that with ammoniacal liquor at 10s. a ton, and a railway rate of 10s. for 180 miles, it would not be economical to carry the liquor more than 20 miles. Discussing the series of questions sent out by the Institution of Gas Engineers, Counsel next drew attention to the fact that the small companies who were said to waste their liquor were not asked whether they had a market elsewhere, or whether they were actually wasting their liquor. Witness replied that as no information was given as to what was being done with the liquor in these cases, it was perfectly right to assume that it was wasted. Later on, Counsel remarked that all this evidence with regard to the questions sent out by the Institution of Gas Engineers had been given before Committees earlier this session, but had had no influence. The retort was that the gas companies had been prevented by the Committees from placing the evidence before them which they had available, and that this was the first opportunity they had had of going into the matter fully. Witness and Counsel disagreed as to the profit to be made by a small company in turning its ammoniacal liquor into sulphate of ammonia. It was true, said witness, that there was a ready sale for sulphate of ammonia; but the profit to be made by small undertakings was not to be compared with that which could be made by a larger concern collecting liquor from its smaller neighbours. A feature of the table put in, drawn attention to by Counsel, was that every Irish company mentioned in the list manufactured its liquor into sulphate of ammonia. In reply to witness's answer that this was the only course left open except pouring it away, Counsel asked why the small companies in England did not do the same thing, as the previous evidence had suggested was possible. Witness said that it was because in many instances a local company could get a better price from a neighbouring gas company than the profit they would make by putting down a plant. Counsel pointed out that against the suggestion that many small companies in England had to waste their liquor was the fact that in Ireland all the small companies turned it into sulphate of ammonia. The reply was that the companies in England who wasted their liquor were very small ones, who could not turn out more than 2 cwt. or 3 cwt. of sulphate of ammonia in a day, and it would be quite unprofitable for them to put up a sulphate plant. It was better to cut the loss in the first instance by pouring away the liquor than to put down plant so small that it would not be remunerative.

In regard to witness's table, Counsel called attention to the fact that

Replies received to an Inquiry sent out on July 19, 1912, by the Institution of Gas Engineers to 61 Gas Undertakings previously stated to be Purchasing Residual Products from others.

Names of Undertakings Purchasing Residuals.	Company or Local Authority.	Statutory or Non-Statutory.	Annual Output of Gas in Millions of Cu. Ft.	Names of Undertakings now Selling to Foregoing Buyers, and Residuals Sold.	Company or Local Authority.	Statutory or Non-Statutory.	Annual Output of Gas in Millions of Cu. Ft.	Names of Undertakings which have Sold to Foregoing Buyers, and Residuals Sold.	Company or Local Authority.	Statutory or Non-Statutory.	Annual Output of Gas in Millions of Cu. Ft.
Abingdon	Co.	Stat.	35	Radley College (tar and liquor)	Private	Non-stat.	..	Wallingford (liquor)	L. A.	Stat.	16½
Blandford	Co.	Non-stat.	16	Wimborne Minster *liq.	Co.	Stat.	19	..	..	..	..
Bradford	L. A.	Stat.	2,150	..	..	..	..	Shipley (liquor)	L. A.	Stat.	175
								Kildwick ,,	Co.	Stat.	44
								and other small works			
Burnley	L. A.	Stat.	785	..	..	..	..	Buy tar now and then from small works	..	..	..
Cowes	L. A.	Stat.	48	..	..	..	..	East Cowes (spent oxide)	Co.	Stat.	38
Chichester	Co.	Stat.	63	Selsey (tar and liquor)	Co.	Non-stat.	5	..	..	..	..
				Emsworth (liquor)	Co.	Stat.	8				
				Petersfield ,,	Co.	Stat.	17				
Commercial (Stepney)	Co.	Stat.	3,575	..	..	..	..	Wandsworth (sp. oxide)	Co.	Stat.	1,130
Coventry	L. A.	Stat.	950	Tamworth (liquor)	Co.	Stat.	54	Kenilworth (liquor)	Co.	Non-stat.	20
				Bedworth ,,	Co.	Stat.	15	Chipping Norton (liquor)	Co.	Non-stat.	11
				Southam ,,	Co.	Non-stat.	2¼	Leicester (coke)	L. A.	Stat.	2,115
				Nuneaton ,,	Co.	Stat.	96	Rugby (coke)	Co.	Stat.	164
				Biggleswade ,,	Co.	Non-stat.	15	Willenhall (spent oxide)	Co.	Stat.	137
				Long Buckby ,,	Co.	Non-stat.	6				
				Desboro' ,,	Co.	Non-stat.	15				
				Swadlincote ,,	L. A.	Stat.	47				
				Coalville ,,	L. A.	Stat.	26				
				West Bromwich ,,	L. A.	Stat.	360				
				Loughborough ,,	L. A.	Stat.	120				
Derby	Co.	Stat.	980	Ashby-de-la-Zouch (liquor)	Co.	Non-stat.	20	..	..	..	..
				Repton ,,	Co.	Non-stat.	7				
				Melbourne ,,	Co.	Non-stat.	9				
				Sheffield (sulp. am.)	Co.	Stat.	3,812				
Devonport	L. A.	Stat.	386	Torpoint (liquor)	Co.	Non-stat.	7	..	..	..	..
Drogheda	L. A.	Stat.	33	Navan ,,	Co.	Non-stat.	8	..	..	..	..
				Balbriggan ,,	Co.	Non-stat.	3				
East Grinstead	Co.	Stat.	39	..	..	..	..	Lingfield	Private	Private	
								S. Metropolitan (B.O.V.)	Co.	Stat.	13,125
Exmouth	Co.	Stat.	64	Budleigh (liquor)	Co.	Stat.	9	..	..	..	..
Formby	Co.	Stat.	25	..	..	..	..	Liverpool (res. generally)	Co.	Stat.	4,300
								Southport ,,	L. A.	Stat.	545
								Skelmersdale ,,	L. A.	Stat.	16
Godalming	Co.	Stat.	38	..	..	..	..	Haslemere (liquor)	Co.	Stat.	24
Great Yarmouth	Co.	Stat.	175	..	..	..	..	Gorleston (tar)	Co.	Stat.	50
								Beccles ,,	Co.	Stat.	24
								Bungay ,,	Private	Private	8
								Harleston ,,	Private	Private	..
								Halesworth ,,	Co.	Non-stat.	4½
Huyton	Co.	Stat.	30	Woolton (liquor)	Co.	Stat.	21	..	..	..	..
Ilfracombe	Co.	Stat.	56	..	..	..	..	Barnstaple (liquor)	Co.	Stat.	47
								Chemical manufrs. (liq.)	..	..	..
Lancaster	L. A.	Stat.	215	Kendal (tar)	L. A.	Stat.	90	Carnforth (tar)	Co.	Non-stat.	15
				Morecambe (tar)	L. A.	Stat.	90	Kirkby Stephen (tar)	Co.	Non-stat.	4
				Staveley (tar) and private works (tar)	Co.	Non-stat.	1	Kirkby Lonsdale ,,	Co.	Non-stat.	4
Leatherhead	Co.	Stat.	43	..	..	..	..	Cobham (liquor)	Co.	Stat.	15
								Gaslight and Coke Co. (Coke breeze)	Co.	Stat.	27,850
								Kingstn-on-Th. (Coke br.)	Co.	Stat.	500
Littlehampton	Co.	Stat.	55	Horsham (liquor)	Co.	Stat.	38	..	..	..	..
				Arundel ,,	Co.	Stat.	19	..	..	..	..
Llanelly	Co.	Stat.	100	Milford Haven (residuals generally)	L. A.	Stat.	16	Carmarthen (res. gener'lly)	Co.	Stat.	29
								Tenby ,,	Co.	Non-stat.	27
								Dowlais ,,	Co.	Stat.	40
Luton	Co.	Stat.	430	..	..	..	..	Ampthill (liquor)	Co.	Non-stat.	7
								Three Coun. Asylm. (liq.)	Private	Private	..
Malvern	L. A.	Stat.	133	..	..	..	..	Colwall (tar)	Co.	Stat.	5
								Ledbury (liquor)	Co.	Non-stat.	11
Mid-Kent	Co.	Stat.	51	Charing (liquor)	Co.	Stat.	4	Private works (liquor)	..	..	..
Montrose	Co.	Stat.	33	Bervie ,,	Private	Non-stat.	1	..	..	..	..
Newhaven	Co.	Non-stat.	20	..	..	..	..	Keymer (liquor)	Co.	Non-stat.	16
								Ditching & Steyning (liq.)	Co.	Non-stat.	5
								Seaford (liquor)	Co.	Non-stat.	35
Ormskirk	Co.	Stat.	47	..	..	..	..	Skelmersdale (res generly)	L. A.	Stat.	16
								Earl of Latham's private works (tar and liquor)	..	..	..
Peterborough	Co.	Stat.	185	Whittlesea (liquor)	Co.	Non-stat.	4	..	..	..	..
Redhill	Co.	Stat.	140	Godstone ,,	Co.	Stat.	7	..	..	..	..
Rushden	Co.	Stat.	112	Raunds ,,	Co.	Non-stat.	12	..	..	..	..
				Wollaston ,,	Co.	Stat.	6	..	..	..	..
Salisbury	Co.	Stat.	145	Wilton ,,	L. A.	Stat.	9	..	..	..	..
				Fordingbridge ,,	Co.	Non-stat.	6	..	..	..	..
				Ringwood ,,	Co.	Non-stat.	10	..	..	..	..
Seaford	Co.	Non-Stat.	35	Crickfield ,,	..	..	..	..	..	..	..
				Burgess Hill ,,	Co.	Stat.	17	..	..	..	..
Seaham	Co.	Stat.	61	South Hylton ,,	Co.	Non-stat.	6	Houghton-le-Spring (liq.)	Co.	Stat.	21
				S. Hetton Coal Co. ,,	Private	Private	..	..	..	..	..
Shrewsbury	Co.	Stat.	207	Craven Arms (tar & liq.)	Co.	Non-stat.	2	..	..	..	..
South Metropolitan.	Co.	Stat.	13,125	S. Suburban (tar)	Co.	Stat.	1,488	Colchester (spent oxide)	Co.	Stat.	165
								S. Suburban ,,	Co.	Stat.	1,488
								Wellingborough ,,	Co.	Stat.	160
								Luton ,,	Co.	Stat.	430
								Bournemouth ,,	Co.	Stat.	850
								Richmond ,,	Co.	Stat.	300
Southport	L. A.	Stat.	545	..	..	..	..	Formby (liquor)	Co.	Stat.	25
South Suburban	Co.	Stat.	1,488	S. Metropolitan (sulphate ammonia)	Co.	Stat.	13,125	S. Metropolitan (S. A. and new oxide)	Co.	Stat.	13,125
Spalding	L. A	Stat.	54	Market Deeping (liq.)	Co.	Non-stat.	4	Bourne (liquor)	Co.	Non-stat.	13
Sudbury	Co.	Non-Stat.	22	Long Melford (liquor)	Co.	Stat.	3	..	..	..	..
				Bures (liquor)	Private	Private	1	..	..	..	..
Tavistock	Co.	Stat.	22	..	..	..	..	Okehampton (liquor)	Co.	Non-stat.	7
Torquay	Co.	Stat.	202	..	..	..	..	Paignton ,,	Co.	Stat.	54
								Brixham ,,	Co.	Stat.	18
Truro	Co.	Stat.	55	Penzance (coke)	Co.	Non-stat.	54	Falmouth ,,	Co.	Stat.	50
				Falmouth ,,	Co.	Stat.	50	..	..	..	..
				St. Austell (tar)	Co.	Stat.	24	..	..	..	..
Wellingborough	Co.	Stat.	150	..	..	..	..	Finedon (liquor)	Co.	Stat.	13
								Rushden ,,	Co.	Stat.	112
								Irthlingboro' ,,	Co.	Stat.	23
Windsor	Co.	Stat.	98	Eton (liquor)	Co.	Stat.	15	..	..	..	..
				Chertsey ,,	Co.	Stat.	70				
Wisbech	Co.	Stat.	65	Upwell ,,	Co.	Non-stat.	1	..	..	..	..

* And negotiating with Gillingham, Mere, Shaftesbury, Newton, and Stalbridge.

a large municipal undertaking like Bradford were not purchasing from any smaller companies. Shipley, who used to sell to Bradford, were not now doing so; and from this Counsel inferred that they were apparently getting a better price from private firms than from Bradford. Kildwick, who used also to sell to Bradford, were now manufacturing sulphate of ammonia. Against these instances, witness pointed out that Nuneaton was a place where they were now getting a better price from a gas concern than they used to obtain from the chemical manufacturers years ago. Likewise, Biggleswade was selling to Coventry; the distance being more than he had previously stated as the economical limit—clearly a case in which a good price was being obtained. Questioned as to the unsoundness of his 20-mile limit, in view of Biggleswade selling to Coventry, witness said it was impossible to lay down a hard-and-fast mile limit, and he had suggested 20 miles on the figures of 10s. per ton for liquor and 10s. per ton for a 180-mile railway journey quoted by Mr. Fitzgerald. Taking up the case of Coventry, Counsel pointed out that Birmingham, who sold all their products, were getting 10d. per ton of coal carbonized, which was very much better than the results obtained at Coventry, where they were actually purchasing ammoniacal liquor, concentrating it, and selling it again. Questioned as to the small places which run liquor into drains or pour it on fields, witness mentioned Briton Ferry and a number of small places near Cardiff. It was pointed out that there was a large chemical-works near Briton Ferry; and in reply to witness's answer that since 1904 they could not get a good enough price to warrant a sale, Counsel said that this was not the case of a small company wasting their liquor because they could not find a market. Witness said he mentioned these cases as instances of small companies having to run their liquor to waste, no matter the reason—it having been suggested that no such companies existed.

Mr. FITZGERALD: Can you give me any specific cases of gas companies who are selling to other gas companies and cannot get a market elsewhere?

Witness: All the information I have is in the return.

Then the result is you do not know of any?—I do not think it is specifically stated in the replies.

The re-examination of witness was very brief. He did not think any comparison between Birmingham and Coventry was fair, because of the enormous make of gas at Birmingham compared with Coventry. Alkali manufacturers had been challenged to get the Attorney-General to move in the Courts against any particular gas companies whom, it was contended, were exceeding their powers by dealing in residuals; but they had not taken up the challenge.

In answer to Mr. THORNE, witness stated that there were many cases in which the circumstances would not permit of running the liquor to waste; and consequently the works were compelled to put down a sulphate plant. This was the reason why so many small works in Ireland had sulphate plants.

The CHAIRMAN: The companies that are running their liquor to waste are quite the exception?

Witness: I agree.

I want to know how high you personally would put the claim of the gas undertakings. Do you think it reasonable that every gas undertaking, for instance, should start the manufacture of sulphuric acid?—Not for the purpose of general trading pure and simple.

Would you think it reasonable to go into the market and buy pyrites for this purpose?—Not unless the particular undertaking was short of acid for its own requirements, and had not sufficient spent oxide, or could not buy it for a reasonable figure.

You do not think it would be a reasonable thing for a gas company to start the manufacture of sulphuric acid as a product for sale?—Not as a trade pure and simple, irrespective of its manufacture of gas.

You gave some evidence of the existence of a ring of chemical manufacturers to keep down prices of raw material. Can you say from your personal knowledge anything about such a ring or combination?—So far as I can judge, there seems to be an understanding among chemical manufacturers by which they seem to have an arrangement in districts. I speak personally for my own district, and I know of one particular case quite recently. When we are in the market, and are able to pit one manufacturer against another, we are able to get a higher price for our liquor than we can under normal conditions.

When the Committee met after lunch,

The CHAIRMAN, speaking to Mr. Balfour Browne, said he hoped he would not repeat evidence to any large extent, because they felt they had heard a good deal of the case for the gas companies. Of course, he would not interfere with Mr. Balfour Browne at all; but the Committee did not wish to have the same evidence repeated over again by different witnesses.

Mr. BALFOUR BROWNE said he proposed not to repeat any evidence he had given, but to supplement it by other evidence of a similar nature—it would not go over the ground again. He still had fifteen witnesses.

The CHAIRMAN: The Committee sincerely hope you will not call them.

Mr. BALFOUR BROWNE: I hope not. Many of them are only to speak on one particular point, and their evidence will not be long.

ALDERMAN PHILLIPS'S EVIDENCE.

Alderman *F. S. Phillips*, the Chairman of the Salford Gas Committee, explained how this authority supplies gas in a considerable area round the borough. He also testified to the fact that at a meeting which was held at the Westminster Palace Hotel on Tuesday, Nov. 19, at which he was Chairman, a considerable number of the large towns owning gas-works were represented and resolved unanimously to oppose the proposal of the Alkali Manufacturers' Association. Among the towns represented were Birmingham, Bolton, Bradford, Burnley, Dewsbury, Doncaster, Glasgow, Huddersfield, Lancaster, Leeds, Leicester, Manchester, Middlesbrough, Rochdale, St. Helens, and Widnes. A Sub-Committee, representing Glasgow, Leeds, Leicester, Manchester, Salford, and Birmingham, were appointed to take charge of this part of the opposition. The objection of the municipalities to the proposed clause was that it would restrict the number of buyers of crude residual products, by taking from the open market as buyers all the gas undertakings of the United Kingdom, with the inevitable result that a closer amalgamation of chemical manufacturers would take place with the object of keeping down the price of the raw materials. It would also enhance the price of the finished products such as sulphuric acid. If the restriction were imposed, he thought that the large gas-works would set up plant for dealing with their raw materials, which, as a matter of fact, they did not desire to do. This, at the same time, would restrict very considerably the supply of raw materials which were in many cases now sold to chemical manufacturers. Of the 809 gas undertakings in the United Kingdom, 700 were small, and were carbonizing less than 20,000 tons of coal per annum. The experience at Salford was that there was an arrangement between the alkali manufacturers and tar distillers for keeping down the prices tendered to gas-works for their ammonia and tar products. As an instance, he mentioned that Messrs. Lockwood and Co. for several years had been the only tenderer to the Salford Corporation; and it had only been after a great effort on the part of the Salford Gas Committee that the price offered by the firm had been increased gradually from 10s. to 15s. per ton for tar. Even at this price the Committee were not satisfied; and in consequence of receiving a communication from Mr. J. E. C. Lord [who has already been mentioned in these proceedings] in 1895, terms were arranged with him for a period of nine months at the price of 21s. 9d. During the currency of this agreement, Mr. Lord communicated to the Salford Gas Committee to the effect that the other tar distillers, whom he said were working to keep the price of tar down, were making things very uncomfortable for him; and he asked the Committee to make his position secure by giving him a longer contract at the same price—viz., 21s. 9d. The matter came before a special Sub-Committee of the Gas Committee; and it was suggested that the Corporation should enter into the business of tar distillation. Subsequently, however, an arrangement was made with Mr. Lord covering a period of seven years. The arrangement was that Mr. Lord would distil the tar; both sides appointing a valuer to determine the market value from month to month. There was an allowance for Mr. Lord's work; and he took all the risk of selling the tar products. This contract had since been renewed twice, and was still in existence. Mr. Lord had his distillery on land let to him by the Corporation at a rental of £100 per year; but under the lease the Corporation had the right to take over the tar-works at the end of any term, on a valuation. These works, however, were much larger than would be required merely for the distillation of the Corporation's own tar. Consequently, if the restriction were imposed, and the Corporation decided to take over the tar-works, they would have a large surplus plant on their hands which would be unremunerative, as they would not be able to work it to its full capacity. The average revenue received from tar at Salford was 2·83d. per 1000 cubic feet of gas sold, and from ammonia the revenue was 3·88d. If the present arrangement with regard to tar was in any way interfered with, he estimated that it would affect the price of gas to the extent of 1d. to 1½d. per 1000 feet. As indicating that prior to the contract with Mr. Lord the other tar distillers were combining to keep down the price, witness mentioned that from 1890 to 1892 the price was 26s. per ton. At the end of the latter year, however, only 9s. was offered. But eventually 10s. was paid; and in the following years the price was gradually worked up by the Corporation to 15s. This evil, he agreed, had now been remedied; but it was not possible for the smaller undertakings to do this. The revenue from residuals was 10·08d. per 1000 cubic feet of gas sold; and adding the revenue from the sale of spent oxide, the total was 11·3d. The Salford Corporation under their Act of 1862 had powers to "purchase" materials in connection with their residual products, and could also sell and dispose of their residual products. In 1882, these powers were amended, and the Corporation were authorized to "purchase . . . materials, matters, or things" in connection with their residual products. A similar state of affairs had existed with regard to the purchase of sulphuric acid as he had mentioned in connection with tar; and it was a curious thing that while in London the price of sulphuric acid showed a tendency to decrease, in Manchester, by an arrangement come to between manufacturers, the price was steadily rising. It was clear that there was no real competition for the business. In Manchester, the latest offer of the private firms was 43s.; but he proposed to ask his Council on the following day to defer their decision with regard to the matter.

Mr. FITZGERALD directed his cross-examination first to the contention that, under the Salford Corporation Act of 1862, the purchasing and dealing in residual products clearly referred to the manufacture of gas by the Corporation. Counsel also put to witness that it was useless to compare prices of sulphuric acid in Manchester and London, unless they knew the strength of the acid, the freight, and the quality. Witness replied that in 1908 they paid 39s. per ton, whereas in London the South Metropolitan Company quoted the South Suburban Gas Company 34s. 8d. In 1909, the lowest Salford tender was 39s. again, and the tender of the South Metropolitan Company to the South Suburban Company was 38s. 6d. In 1910, the Salford price was still 39s., whereas the South Metropolitan price was £2 2s. 5d. But in 1911 the Salford price had increased to 40s.; and the South Metropolitan Company's price was only £1 12s. 6d. Counsel's comment on the latter figure was that at that time the South Metropolitan Company had learned the figure which the South Suburban Company were paying, and quoted below it. The whole fear was, continued witness, that if the restriction was imposed, gas undertakings would be placed in the hands of the chemical manufacturers. An example of this was shown in the Coal Association, which had been instrumental in increasing the price by 1s. per ton in 1900; and there had been a further rise of 2s. 6d. These people had a way of arranging what they were going to do; and he asked the Committee to leave gas undertakings to do the very best they could for themselves. Counsel put to witness, as he has put to all the witnesses, that the proposed restriction would not interfere in any way with anything which the Corporation were now doing so far as working up their own residual products was concerned, and that witness was under a misapprehension also if he thought the clause would prevent the Corporation dealing in their own tar. Witness replied that this would affect them on the tar question if they purchased Mr. Lord's distillery, as they would then want to buy other tar to keep these works fully employed. On the question of cheap

gas, Counsel asked if it was one means of providing cheap gas to do as Salford did—viz., to transfer from £15,000 to £30,000 a year from gas profits in relief of rates—a sum equal to 7d. per 1000 cubic feet of gas sold? Witness's reply was that, under the Salford Corporation Gas Order of this session, they were now limited to £10,000 a year for this purpose.

MR. WILLIAM KAY'S EVIDENCE.

Mr. *William Kay*, the Chairman of the Manchester Gas Committee, resented the proposed restriction, because it would interfere considerably with the processes being carried on at Manchester, and would be a limitation of the powers already possessed there. Under the Manchester Act of 1851, very similar powers were given to the Corporation as had been mentioned in the case of Salford. In 1895, the Manchester gas undertaking suffered considerable loss from a combination among the chemical manufacturers with regard to the sale of ammoniacal liquor. For several years only one firm tendered, and the result was that the Committee decided to erect sulphate of ammonia plant. The chemical manufacturers thereupon approached the Committee and offered to give better terms if they would forego the idea. It was, however, persisted in; and the Local Government Board finally granted the necessary loan for the plant, in spite of opposition from the chemical manufacturers. This was in 1899, and the financial result had been very successful. In 1902, the last year in which they sold their liquor, the revenue from it was 34·12 per cent. of the cost of coal. In 1903, when they were manufacturing their liquor into sulphate of ammonia, the result was only 46·18 per cent. of the cost of coal. In 1904, it was 50 per cent.; and in 1912, it had risen to 71·91 per cent. The total revenue from residuals at Manchester was equivalent to 11·73d. per 1000 cubic feet of gas sold. Manchester purchased spent oxide from local chemical manufacturers; and it was considered essential that they should also have the opportunity of buying from gas undertakings in order to secure fair competitive prices. In the process of carbonization adopted in Manchester, cyanides were produced. If they used their own spent oxide which contained these cyanides to produce sulphuric acid, they would lose the valuable blues in the process of burning. Consequently, they sold their spent oxide by tender to manufacturers on a sulphur-*plus*-blue basis, and purchased back the spent oxide on a sulphur basis. By this means the manufacturers were able to extract from the spent oxide the valuable blue which would otherwise be lost. It really meant that the gas-works had not gone so far in the process of chemical manufacture as they would have to do in order to get the utmost from the spent oxide, nor, indeed, did they desire to do more than they were doing at present. They preferred private enterprise to deal with the blue, cyanides, prussiates, and other products; but it was a fact that the present favourable terms which they were able to make with the chemical manufacturers were due to their ability to purchase from other gas companies. If Manchester did not secure the valuable blue in their spent oxide, they would lose £3000 a year.

In cross-examination by Mr. FITZGERALD, witness said that at the Manchester Gas-Works they turned the ammoniacal liquor into sulphate of ammonia, which was sold. They did not, however, purchase ammoniacal liquor from other gas-works. Counsel suggested that the proposed restriction would not affect the present business at all. Witness replied that the Corporation reserved the right to manufacture as much sulphuric acid as they thought fit to keep their sulphate plant running. Further, under the proposed restriction the Corporation would lose the value of the blue, as they would not have the plant to recover it. At any rate, this was how he read the clause. In answer to the suggestion that Manchester has less return from its residuals than some other gas undertakings, witness said this was due to the fact that at present they made 20 per cent. of carburetted water gas, from which there was practically no residual. Last year the make of water gas was 1,033,000,000 feet, which necessarily had a marked effect upon the revenue from residuals.

In re-examination, witness said that the restriction would also be bad for the manufacturer, because the Manchester works were so large that they would at once commence tar distillation which they had no desire to do. They would also commence to work a cyanide extraction process.

Wednesday, Dec. 4.

PROFESSOR LEWES'S EVIDENCE.

Professor *Vivian B. Lewes*, the Chief Superintending Gas Examiner to the Corporation of the City of London, and Professor of Chemistry in the Royal Naval College, expressed the opinion that it was in the interests of the community and the public that everything which would cheapen gas should be encouraged. It was because he held this view that he had always supported gas companies in Parliament whenever they came up for the repeal of any unnecessary restrictions. He had always advocated the removal of restrictions upon the industry that might militate in any degree against the cheapening of gas; and the whole tendency in Parliament of late had been to do this and to give gas companies a free hand to make their gas in the cheapest possible way. About half the gas-works in the United Kingdom converted their liquor into sulphate of ammonia, for which there was an ever increasing demand; but ammoniacal liquor from other kinds of works in large quantities was available. About 10 per cent. of gas-works dealt with tar in the sense of preparing it for road work, and not more than 3 per cent. dealt with it as distillers. The result of this limited treatment of tar by gas companies had been a tendency for tar distillers to have the market in their own hands. Small companies should certainly be allowed to co-operate among themselves in the matter of tar treatment, in order to save transit and give a cheaper supply in their own immediate neighbourhood. The important point of the inquiry, in his mind, was that the legislation which would be affected by the decision of the Committee was in the future; while they seemed to be entirely arguing upon the practice of the past. At the present time, the gas industry, the tar industry, and the chemical trade were all in a condition of unstable equilibrium. Advances were being made so rapidly that an ill-advised restriction of any kind at the present moment might work very great harm in the future. He had read the Model Clause in the Model Bill for 1913; and if it were adopted generally, it might do considerable damage to the gas industry without doing any good to those who sought the restriction. It would place three-quarters of the gas industry, and these obviously the smaller works, at the mercy of the tar distillers. It was the cumulative effect of any legislation upon the various details which went to reduce the price of gas to the consumer which he feared. There were already a large number of restrictions upon gas companies, and every other restriction gradually piled up the load, and caused a tendency exactly the reverse of that which would cheapen gas. Gas companies had very little chance indeed of cheapening gas unless they could deal with their residuals. Coal and labour were both increasing in cost; and if on the top of this there were placed a number of small restrictions, there would be a cumulative effect which might bring about trouble in the future. The day of comprehensive economies in the gas industry had gone. It was a cheeseparing era which had now come in. The question had been forced to the front by a considerable increase in the value of residual products; and the whole of this inquiry had arisen owing to some small cases of trading by gas companies. At present everything was undergoing change in the gas-works themselves. The first ten years of this century was an extraordinarily active period, with a change taking place throughout the whole methods of carbonization. Up to the time when rich gas was the really important thing—up to the beginning of this century—all gas managers used small charges in their retorts and heated up to a very high temperature. Afterwards, when the reduction in the illuminating power took place, various experiments were made to improve carbonization. The introduction of charging machinery and other things of this kind had led to the filling of retorts as far as it was possible, instead of using small charges. This was in horizontal retorts.

The CHAIRMAN: I do not want to interrupt you, but what you are telling the Committee is, if we impose restrictions now, we may be incurring danger as to which we do not know the extent?

Witness: That is so.

Because things are moving so rapidly in the chemical world that some new process may come forward, and we might unwittingly restrict something that we do not wish to restrict?

Witness said that was so; but he wished to put it a great deal stronger than that. These things were already moving. They were not things which were simply in the human brain, but things which were actually in existence. Then there was one rather important point which he wished to emphasize strongly. At the time that the full retort was introduced, there were also vertical retorts, and retorts put up on end, in which gravity entirely did the charging and discharging. There was also the continuous system, in which coal was always going in at the top and coke coming out of the bottom.

Mr. FITZGERALD questioned whether all this evidence was material. He was not objecting to horizontal or vertical retorts.

Witness: But I will show you in a moment where your interests come in. Continuing, he said that this brought about a slight alteration in the kind of tar. The tar from the old retorts, with their light charges and high temperatures, contained benzol in a condition in which it was very readily obtained from the tar. But tar from these full retorts was of a very oily character; and the benzol which was there was not nearly so easily separated. This was not at all a favourite tar with the tar distiller, who had not been used to dealing with it on new lines. On the new lines this tar was more valuable than the old; but the old method of procedure was not nearly so valuable. So that in all probability if these small gas-works were placed in the hands of the tar distillers entirely, the tendency would be to give them a lower rather than a higher price for their tar. With regard to Mr. Pearce's evidence, that small gas companies could manufacture sulphate of ammonia themselves, if this were generally done it would close a source of production to the alkali manufacturers altogether. Accepting Mr. Pearce's figures with regard to Longford, it was seen that a profit of £63 per annum was made there on a production of seven tons of sulphate of ammonia. It was impossible to have a better example than this of the desirability of interdealing between gas companies. Working out the process at Longford on their make of gas and quantity of sulphate, it was seen that the plant could not be in use more than three weeks in the year. He did not suppose there were any other gas-works anywhere near Longford; but if there were, obviously it would be to everybody's benefit for these smaller companies to send their liquor to Longford in order to keep the sulphate plant working at more or less full capacity. Longford could very well take the liquor from 17 other works of similar size. The very last thing that a gas manager desired was to go in for working up his residuals if he could avoid it. As a rule, in a small works, the gas manager was a very hard-worked and a very rarely overpaid individual. His great desire was to do his duty as regards the output of gas. As he was now placed, he had the advantage of the competitive offers from gas undertakings and alkali manufacturers, which contented him without driving him to put in his own plant. As to gas undertakings being the only source of supply of ammoniacal liquor, he agreed with the previous evidence that they only produced about 42 per cent. of the total supply. While ammonia sulphate was produced direct in coke-ovens, iron-works, and shale-works, ammoniacal liquor could be obtained in the form required by chemical manufacturers if they gave an inducement to the owners of these works not to produce sulphate of ammonia direct. There had been the suggestion that pyrites was in competition with spent oxide as another source of supply; but this was scarcely the right way to put it. The real competition was between spent oxide from gas-works and native Sicilian sulphur. He contended that the private interests of alkali manufacturers should not deprive the public of the benefits that were steadily accruing to them from the absence of any restrictions upon gas companies.

Mr. FITZGERALD cross-examined witness on the point that he was not connected with the trade in any way.

Mr. FITZGERALD: You are in favour of cheap gas?

Witness: Yes.

Do you think that paying large sums to the relief of rates is a good way of obtaining a cheap gas?—That is municipal trading. I did not say that I am in favour of that.

On the question of a supply of ammoniacal liquor being obtained

from elsewhere than gas-works, witness was asked to name a single place where this could be obtained in any quantity. He admitted he could not, simply because the whole of the liquor made by these works was taken up by the competitors of the alkali manufacturers and was never on the market. When benzol was cheap in price, sulphate of ammonia was made direct at certain coke-oven and other works; but at the present time gas liquor was being made in the same way as in gas-works, simply because of the increased price of benzol. In the direct process the gas was washed with sulphuric acid to get the ammonia out of it; but this decreased the quantity of benzol. The proprietors of these works did not mind doing this with benzol at 5d. a gallon; but it was now up to a figure nearly double this, and a great many works were making ammoniacal liquor to get the extra yield of benzol.

Mr. FITZGERALD complained that he could not get a direct answer to his questions, and once more asked whether Professor Lewes could give a single instance where ammoniacal liquor was produced in any quantity for sale except gas-works, and received the brief answer, "I cannot."

In re-examination, witness said ammoniacal liquor would be available at coke-ovens and elsewhere if a proper inducement were given to the proprietors to produce it instead of sulphate of ammonia.

The CHAIRMAN: You know that a gas company are allowed to work up their own residuals, and also that, by Lord Ritchie's clause, they would be allowed to buy the materials required for working up their own residuals. How far do you consider that a gas company ought to be allowed to go?

Witness: It is an extremely difficult point. My own view rather is that nothing should be done which would in any way hamper a gas company in working up the residuals of their own trade.

But how far do you think they ought to be enabled to buy crude tar (say) from other gas companies, and start a large business in distilled or dehydrated tar?—Supposing there were a dozen small gas companies, it would be fair for one of them to take sufficient tar from the surrounding works to enable it to keep a plant continuously running to supply the road needs in its own county. But I should not allow a gas company to go into the market and buy up iron pyrites or things of that sort totally outside gas manufacture for making large quantities of sulphuric acid.

Mr. THORNE: Is that not done?

Witness: No.

The CHAIRMAN: Would you think it legitimate that the gas company should buy up spent oxide from neighbouring gas companies for the purpose of manufacturing and selling sulphuric acid?

Witness: Yes, I can see no harm in it, because they would do it in open competition with the people who want spent oxide.

In answer to another question by the Committee, witness mentioned that at Limerick the gas manager had put up a recovery plant for £330, and in one year had paid for the plant and made £600 profit.

At the conclusion of Professor Lewes's evidence,

The CHAIRMAN, addressing Mr. A. M. Paddon, Junior Counsel for the Gas Companies (who had been in charge of the case all the morning in the absence of Mr. Balfour Browne and Mr. Hutchinson), said that while he did not wish to put Mr. Paddon in an awkward position, seeing that he was alone, he would like to point out that a certain amount of evidence which had been heard was really argument and not evidence. He quite agreed that the opinions of the gentlemen whom they had heard were entitled to receive, and would receive, great weight at the hands of the Committee; but he did not wish the inquiry to go on too long. While he would not restrict Mr. Paddon at all in giving any evidence he thought fit to call, he did ask him to bear in mind the fact that the Committee had already heard witnesses from a great many branches of the business, and if the witnesses yet to be called were merely for the purpose of reinforcing by argument the evidence of the previous ones, he did not think it would add much, in the Committee's eyes, to the case for the gas undertakings.

Mr. PADDON said he would do all he possibly could to give effect to the wishes of the Committee. Professor Lewes, from the nature of his position, was a very important witness, and one to whom matters of opinion could very pertinently be put. The remaining witnesses, however, would only deal with matters of fact.

MR. MAYBURY'S CROSS-EXAMINATION.

Mr. *H. P. Maybury*, the Kent County Surveyor, was recalled, as arranged, for cross-examination. His evidence-in-chief was given on Nov. 28, and was reported on p. 768 of our last issue.

Mr. FITZGERALD did not ask many questions Those that were put were directed to the point that there was nothing in the proposed restriction which would prevent a gas-works putting down a tar-distilling plant and selling to the local authority. Mr. Maybury said that several of the Kent gas-works were too small to do this, and that he looked forward to combination among them so that the larger ones could undertake to treat the tar for the smaller ones. He feared this would be prevented if the restriction were imposed.

MR. FLETCHER STEVENSON'S EVIDENCE.

Mr. *F. W. Stevenson*, the Engineer and Manager of the Coventry gas undertaking, said he had bought spent oxide from a few neighbouring gas-works to the extent of about 120 tons. With regard to ammoniacal liquor purchases, he gave the following figures: In 1906, 34,360 gallons; in 1907, 60,820 gallons; in 1908, 26,160 gallons; in 1909, 7104 gallons; in 1910, 4880 gallons; in 1911, 79,066 gallons; in 1912, 482,358 gallons. This was converted into concentrated liquor and sold to Messrs. Chance and Hunt. Dealing with the contract with the Cooper Chemical Company for the supply of sulphuric acid, already mentioned in the evidence for the other side, witness said that this began on April 1, 1912. The reason for the Corporation not having been able to keep the terms of it was that the construction of the sulphuric acid plant was delayed chiefly owing to the coal strike; and when the plant was finally installed, the concentrating portion of it turned out to be a failure. This was now being rebuilt. As to the contract with Messrs. Courthall and Co., he had an interview with the manager of the firm on Sept. 11, 1911, and offered to supply him with commercially pure sulphuric acid at a price that would save him the difference in carriage between Manchester (where he was then getting his supply from) and Coventry. This difference in price came out in conversation at 8s. per ton. This was the extent of the negotiations with Messrs. Courthall, and nothing was ever put into writing. In 1904-5, the Corporation installed a small sulphuric acid plant to supply the necessary quantity for treating their own ammoniacal liquor. This was probably the smallest acid plant in the kingdom; but it resulted in the cost for acid being reduced from 42s. per ton of sulphate, which was formerly paid to chemical firms, to 26s. 2d. and 26s 9d. In 1907, the Corporation entered into a contract with Messrs. Chance and Hunt to supply them with concentrated ammonia water for a period of seven years, of not less than 12 oz. strength. Prior to this time, the Coventry Gas-Works manufactured all their liquor into sulphate. The contract with Messrs. Chance and Hunt was to supply all the ammonia water from the Coventry Gas-Works; and this contract produced a better price than when the liquor was converted into sulphate. In 1911, objection was taken to the Coventry works purchasing liquor from other gas-works and selling it outside in concentrated form. Messrs. Chance and Hunt also objected to being supplied with more concentrated liquor than was actually produced from the Coventry Gas-Works, and consequently the remainder was now turned into sulphate. A much larger acid plant had since been put up, which allowed him to deal with the residuals purchased from other gas-works. The real object of this was to obtain a better price for the spent oxide than he was otherwise able to secure; and also, as there was a large demand in Coventry for commercially pure acid, he hoped to be able to meet this.

In answer to questions by Mr. FITZGERALD, witness said that the make of liquor at Coventry was 2,400,000 gallons, apart from what was purchased. He took up his position at Coventry in 1902, and commenced sulphuric acid manufacture in 1904. Before this, he had had ten years' experience of a similar plant at Sheffield. The size of the plant originally was to manufacture 800 tons; but it was increased last year to 1500 tons. He did not agree that the plant had been more or less a failure. There were two portions to the plant—the acid chambers and the concentrating plant. The former, which were by far the most expensive part of the equipment, had been completely successful. It was the concentrating plant that had been a failure. He denied ever having written a letter to Messrs. Courthall offering sulphuric acid at 20 per cent. less than they were previously paying. On being shown a letter from the manager of the firm to the Cooper Chemical Company, who were then supplying Messrs. Courthall, witness replied that it must have been the manager's own calculation. The only negotiations between himself and the firm in question had been as given in his evidence-in-chief. He believed the price then being paid by Messrs. Courthall was 63s. per ton. At present, their own spent oxide at Coventry was not sufficient to manufacture the amount of acid which he was selling. He had a stock; but when this was gone, he would have to buy pyrites. The reason was that after the acid plant had been installed the Corporation decided to go back to lime purification.

Lord HOWARD DE WALDEN asked witness to explain the statement which had been made that Coventry obtained less for its residual products than other undertaking which did not work them up.

Witness said the comparison that had been made was quite unfair. It had, for instance, been said that he obtained 6d. per ton of coal carbonized less than certain other gas undertakings; but the fact must be taken into account that Coventry was in the Midlands, far away from a port. Edinburgh had a port at Leith, the Wandsworth Company had access to the River Thames, and Birmingham and other undertakings were well situated in this respect. He was quite confident that this accounted for the difference, as other places near to Coventry received very similar amounts for their residuals. Burton-on-Trent, Leicester, Newcastle (Staffs.), Derby, and Nuneaton could all be quoted in this respect. In 1911, the amount received for the ammonia products per 1000 cubic feet of gas sold at Burton was 2·59d.; at Leicester, 2·23d.; Newcastle (Staffs.), 1·71d.; Derby, 2 33d.; and Nuneaton, 1·83d. At Coventry, the amount was 2·24d., which was slightly over the average of the neighbouring works—all of them of similar size. Further, Burton-on-Trent were concentrating and selling to Messrs. Chance and Hunt. Again, at Coventry, he was using a large quantity of North Staffordshire coal, which did not produce so much ammonia as Yorkshire or Derbyshire coal. All the coal mined near Coventry was house and steam coal. The largely increased quantity of ammoniacal liquor bought this year at Coventry was accounted for by the fact that certain neighbouring gas companies had approached him to purchase.

In reply to Mr. THORNE, witness said there was absolutely no foundation for the suggestion that he was relying on the rates at Coventry to undercut. He would not buy anything which would not be an advantage to his undertaking.

MR. A. F. PHILLIPS'S EVIDENCE.

Mr. *A. F. Phillips*, who is Consulting Engineer to a number of gas-works, referred specially to seven undertakings in the north of London in which he is interested, and all of which are in close proximity to each other. The advantages of co-operation and mutual assistance in the matter of residuals produced from these works would be very great. Owing to the conditions of some of the works, it was essential that the ammoniacal liquor should be sent from these to other works where it could be converted into sulphate of ammonia. For instance, the Hornsey Gas Company were prohibited from working up their residuals in any way; but the New Southgate Company, who were within four miles, could deal in residuals; and arrangements were being made for New Southgate to take the Hornsey liquor. At present, Hornsey were receiving £3 12s. 6d. for the liquor produced per 100 tons of coal carbonized; whereas if it could be dealt with by Hornsey at their own works the figure would be £9. As, however, this was impossible, he was negotiating with New Southgate, and hoped to arrange a price of £6 15s., against the £3 12s. 6d. he had already mentioned as received from a private firm. In connection with the Maidenhead Gas Company, with which he was also connected, he mentioned that the best price obtainable for the liquor per 100 tons of coal carbonized was

£1 6s. 3d. at the gas-works; this figure being quoted by Messrs. Burt, Boulton, and Haywood. Maidenhead would prefer to work it up themselves; but the difficulty of disposing of the effluent stood in the way. Again, the Twyford Gas Company sold to the Wokingham Gas Company, because they could not get an offer from the manufacturers which would pay them to dispose of the liquor in this way.

Mr. FITZGERALD asked why the matter of dealing with the residuals had apparently only recently become important in the eyes of the smaller gas companies. Witness replied that the increasing necessity for supplying cheaper and cheaper gas was forcing the matter to the front. As to the relations between the Hornsey Company and the New Southgate Company, the latter had only had a sulphate plant for two years. In addition to this, the price of sulphate ten years ago was by no means as high as to-day; and therefore it did not then offer the same inducement to gas companies to worry about.

The CHAIRMAN: I suppose the restriction upon Hornsey and the other places which are not allowed to deal with their residuals was in respect of the residential character of the town, and that the restriction would remain, whatever decision the Committee may come to?

Mr. PADDON said that was so.

MR. E. L. BURTON'S EVIDENCE.

Mr. *E. L. Burton*, the Managing-Director of the Bishop Stortford, Harlow, and Epping Gas Company, Manager of the Cromer Gas Company, and Secretary to the Brighton and Hove General Gas Company, among others, spoke of the difficulty experienced at the Bishops Stortford works in getting a supply of sulphuric acid at a reasonable price. In 1909, the price quoted by the West Ham Chemical Company was 62s. 6d. per ton; while at the same time the New Southgate Company, with which he was associated, were receiving a supply from Messrs. Spencer Chapman and Messel, Limited, at 40s. per ton. The West Ham Chemical Company, however, refused to reduce their price to the Bishops Stortford Company; and he communicated with two or three other makers with a view to getting a lower price. A representative of Messrs. Spencer Chapman and Messel called upon him, and on learning that he was dealing with another firm, declined to quote. A representative of another firm came, and put more or less the same questions, and said that although his company would very much like to do business they could only, under the circumstances, quote a prohibitive price. The Commercial Gas Company then quoted a price, which was accepted, and to-day the Bishops Stortford Company were taking acid from the Commercial Company. The terms were 30s. per ton on rail in London, or 39s. per ton at Bishops Stortford. To this had to be added 1s. 3d. per ton for carboys, bringing the price up to the same as was being paid by the New Southgate Company, but considerably less than that previously paid by the Bishops Stortford Company.

During witness's cross-examination, he mentioned that one or two makers had told him that there was an arrangement with regard to tar and sulphate of ammonia by which they did not interfere with one another within limits; but what these limits were he did not know. With regard to the price quoted by the West Ham Chemical Company, he was not aware that this firm only dealt in the highest class of acid, made from Sicilian brimstone. In any event, the acid supplied by the Commercial Gas Company at the much lower price suited his purpose admirably.

Mr. BALFOUR BROWNE at this point came into the room for the first time during the day, and

The CHAIRMAN spoke to him with regard to the character of the evidence in similar terms to what he had said to Mr. Paddon earlier in the morning.

Mr. BALFOUR BROWNE replied that he had about seven more witnesses, who would merely speak as to certain facts. He thought he ought to prove that there were cases in which gas companies were running their liquor to waste because they could not find customers. One witness he ought to call—and whom he regarded as a very important one—would speak as to the condition of things in Ireland. There had not yet been an Irish witness, and the conditions there were somewhat different from those in England. He agreed that he would not be adding anything to the evidence already given by mere repetition; but if there were any new facts, he was quite sure the Committee would like him to call a witness with regard to them.

The CHAIRMAN: Certainly.

Mr. BALFOUR BROWNE said the evidence he had to call would be quite short—he was, in fact, almost hoping to be able to address the Committee during the afternoon.

MR. W. A. SCHULTZ'S EVIDENCE.

Mr. *W. A. Schultz* said he had had thirty years' connection with small gas companies, both statutory and non-statutory. One of his undertakings was the Counties Gas Company, who had seven works in the Midlands. This was a non-statutory company. It was their intention to erect a sulphate plant at their Bicester works, where all the liquor from the remaining six works would be dealt with. By doing this, he anticipated making a profit of £100 more than he would do if he sold the liquor to chemical manufacturers. As suggesting that the prices for liquor were controlled by the members of the Alkali Manufacturers' Association, he mentioned that from 1901 to 1904 the price was never more than 11s. 7d.; but suddenly in that year, for some reason, Messrs. Brotherton and Co. quoted 22s. 6d. He anticipated an effect upon the price of gas, if he could deal with all the liquor of the seven Midland works he had referred to at Bicester, of 2·4d. per 1000 cubic feet. At many small works with which he was connected there were sulphate plants; but they were not working continuously. They had been put in solely because the price offered by chemical manufacturers for the liquor did not pay the cost of carriage. The Ascot Gas Company had an Act in 1882, giving them power to deal in, and sell and dispose of, all residual products; and this he claimed entitled the Company to carry on such operations as were being complained of. Dealing with the difficulties experienced at Ascot in disposing of their liquor and tar, witness mentioned that ten years ago he could only get a quotation of ½d. per gallon for tar in casks, or 1d. in railway tanks; while no offer at all could be obtained for the liquor.

In cross-examination, witness agreed that at present the proposed restriction would not seriously affect the Counties Gas Company; but it would do so to the extent of preventing them from selling to other gas companies. At the same time, the Counties Company had a Bill in Parliament for the next session which would render it a statutory concern. Therefore it would come under the full operation of the proposed clause. He also mentioned that sulphate plants had been put down at Whitchurch, Hungerford, and other places, and that not until this was done did the price of sulphuric acid show any tendency at all to decrease.

MR. W. DOIG GIBB'S EVIDENCE.

Mr. *W. Doig Gibb*, the Chief Engineer to the South Metropolitan Gas Company, and formerly Engineer to the Newcastle Gas Company, said that he had visited on the previous Saturday and Monday six recovery plants not situated at gas-works, and had inquired into the circumstances attending the production of ammoniacal liquor there. He had ascertained that liquor was being produced to an extent which would render it of commercial value on the market. The manner in which this liquor was recovered was precisely the same as in ordinary gas-works. The six places he mentioned were: The Priestman Colliery, Durham district; Messrs. J. Bowes and Partners, Marley Hill; the Lambton Colliery, Fence Houses; the Staveley Coal and Iron Company's chemical-works, Derbyshire; the Clay Cross Company's chemical-works, near Chesterfield; and the Grassmore and Hasland Colliery Company's chemical-works. At the Priestman Colliery, he found that they were producing liquor to the extent of 8,000,000 gallons on an 8-oz. basis. The actual strength was 5·2 oz. per gallon. As a matter of fact, he had been surprised at the strength of the liquor he found at these works, as he had always been led to understand that it was much weaker. He produced bottles containing samples of the liquor taken from all the works; and his analyses of them had been checked by Mr. Carpenter. Messrs. Bowes and Partners produced about 3,200,000 gallons on the same basis; the actual strength of the liquor being 11·4 oz.—much higher than the ammonia contained in the average liquor produced at gas-works. The production at the Lambton Colliery was 2,500,000 gallons, with an actual strength of 3·1 oz.; at Staveley, the quantity was 14,500,000, with a strength of 6·5 oz.; at Clay Cross, 4,000,000 gallons, with a strength of 5·5 oz.; and at Grassmore and Hasland 5,300,000 gallons, with a strength of 3·5 oz.

Mr. FITZGERALD, in his cross-examination, suggested that most of the works mentioned produced sulphate of ammonia direct, and that this was the reason why it was not on the market. Witness replied, however, that it was only a question of £ *s. d.* as to whether sulphate of ammonia was produced direct, or ammoniacal liquor was made in its stead.

MR. G. W. ANDERSON'S EVIDENCE.

Mr. *George W. Anderson*, of Messrs. Anderson Bros., gas engineers, of Westminster, was called to give evidence as to the conditions in Ireland. Between 1875 and 1885, when sulphate was worth £20 per ton, it was, he said, worth while carrying ammoniacal liquor over long distances in order to have it concentrated; and it was carried from places as far apart as Fermoy and Waterford. Under present circumstances, however, unless it were concentrated, the transport of the liquor in Ireland was a costly matter. The weight of liquor necessary to make a ton of sulphate was 15½ tons of 8 oz. strength, and to send this away in casks would mean an additional 6 tons 18 cwt.—making some 22 tons of material in all to get a ton of sulphate. At many places in Ireland, such as in Fermoy, Lismore, and Longford, sulphate plants had been erected; but they were not in continuous and economical operation. Longford might, under favourable conditions, take the liquor from Cavan; but there were no chemical-works in reach of any of the places, and they were therefore forced to put up sulphate plants. Unsuccessful endeavours had been made to sell to the chemical trade in Cork and Dublin; but only one quotation had been received, which was such a price, and under such conditions, that there would have been no profit. Dublin and Cork were the only places in Ireland for sulphuric acid. The whole of the tar from the works he was connected with was sent to Dublin; but it only brought in a very small sum. On one occasion they had burnt the tar on the works. With regard to the supply of coke, as he read the proposed clause, it would be restricted.

The CHAIRMAN: Do you mean the Model Clause, or Lord Ritchie's Clause?

Mr. PADDON said witness was referring to Lord Ritchie's Clause.

The CHAIRMAN remarked that his opinion was that the Model Clause was stricter against gas companies than Lord Ritchie's.

Mr. PADDON said in that case, of course, the comment would apply to the Model Clause.

Mr. MACASSEY cross-examined witness as to his contention that co-operation among small companies would be a desirable thing, and pressed at some length the question as to whether witness could give him instances of companies interdealing in Ireland. He was told that Fermoy and Carrickfergus had sold to Waterford some years ago, and that Tipperary was making arrangements to buy from the Thurles Gas Company. In this case, the matter had been discussed; but they had been afraid to continue the negotiations, pending the decision of the Committee. If the policy of co-operation could be extended among the smaller undertakings, it would then be possible for the gas-works working sulphate plant to employ a competent manager, and run the undertaking efficiently.

The importance of reducing the price of gas in Ireland was also emphasized by witness in reply to questions by the Committee; and he mentioned that in Lismore the price was as high as 7s. 6d. per 1000 cubic feet.

MR. THOMAS BERRIDGE'S EVIDENCE.

Mr. *Thomas Berridge*, the Engineer and Manager of the Leamington Gas-Works, and consulting engineer to a number of small gas-works situated considerable distances from chemical words, mentioned that he knew of instances where liquor could not be disposed of or even destroyed; and he had been driven to evaporating it under retorts. The Billericay Gas Company had been obliged to sell their liquor to

the Brentford Gas Company, owing to inability to secure a quotation from chemical manufacturers; but under the proposed clause the Brentford Company could not buy from the Billericay Company. Before the Coventry Corporation began to purchase residuals from companies in the locality, he was unable to get a satisfactory price owing to the absence of competition. Prices had certainly been better since the Coventry Corporation took up the business. He had recently visited a large number of small works in Essex, where the liquor was being evaporated under retorts or thrown on to the ground. There were considerable difficulties in the way of small works putting up sulphate plants. For instance, a sulphate plant to deal with a gas-works having an annual make of 5,000,000 cubic feet of gas would cost £450. and the output of sulphate would only be 5 tons per annum. At £13 per ton, there would be a revenue of £65, the cost of manufacture would be £25, and the balance of £40 would not be sufficient to cover interest on capital and depreciation of plant, which, at 10 per cent., would be £45. Further, depreciation on the plant when lying idle, which it would be for a considerable period of the year, would be greater than when it was in full employment. Again, there were difficulties in the management of sulphate plants on small gas-works, as the manager was usually an educated stoker, and the secretary the local schoolmaster.

Asked by Mr. FITZGERALD for a case in which a small gas company had asked a chemical manufacturer for a quotation for liquor, and had been unsuccessful, witness said he believed that the Rayleigh Gas Company had asked Messrs. Burt, Boulton, and Haywood, but could not get a satisfactory price.

MR. J. MOGFORD'S EVIDENCE.

Mr. *John Mogford*, the Manager of the Briton Ferry Urban District Council gas and electricity undertaking, said that there were a considerable number of gas undertakings in South Wales which were running their liquor to waste, because they could not get a satisfactory price from the alkali manufacturers. There were more than twenty undertakings in South Wales doing this. They were all small places, and he advocated dividing the district into groups, and the erection of sulphate plant at the largest of the works to take the liquor from the remainder. Pontardulais used to sell to the Swansea Gas Company; but since the chemical clause was inserted in the latter's Order this year, this was prevented, and it put Pontardulais in a difficulty.

Mr. FITZGERALD asked witness if he knew that the Pontardulais works were now getting a better price from the Cardiff Chemical Company; and he replied in the negative.

MR. H. BUCKLEY'S EVIDENCE.

Mr. *H. Buckley*, the Manager of the Windsor Royal Gaslight Company, said he had put up a sulphate plant seven or eight years ago, which could make from 20 to 100 cwt. per annum. At one time the Chertsey Company, who were near the Windsor works, sold liquor to a chemical firm at £2 5s. per ton; but he was able to offer them £3 5s., and got the contract. When the firm in question found out what was going on, they immediately offered £4 10s. He, however, made a contract with Chertsey for a number of years. The instance, however, served to show that while there was no competition prices were kept low.

Thursday, Dec. 5.

On the resumption of the proceedings this morning,

The CHAIRMAN asked Counsel whether the clauses he had referred to a day or two ago were yet ready.

Mr. FITZGERALD said that, as far as he was concerned, he had considered the matter, and had decided to ask the Committee to adopt the amended clause in the Model Bill.

Mr. BALFOUR BROWNE said that since yesterday he had gone over the proofs of the remaining five witnesses which he had; and although there was one rather important witness in Scotland, the proofs did not seem to carry the case much further than the Committee had heard it. Therefore he did not propose to call any further witnesses. With regard to the clause, he would like to recall to the memory of the Committee that the instruction to them was—"That it be expedient that a Joint Committee of Lords and Commons be appointed to consider whether any, and, if any, what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals." He was therefore going to ask the Committee to report in answer to this instruction that no restrictions should be put upon gas companies at all. The result of this would be that the gas companies would be relegated back to the Model Clause as it was before the alterations that were introduced this session. The Committee therefore now had both propositions before them in the form of the old Model Clause which he promulgated, and the new Model Clause which Mr. Fitzgerald promulgated.

Counsel's Speech on behalf of the Gas Undertakings.

Mr. BALFOUR BROWNE, having decided to call no further evidence, then proceeded with his speech on behalf of the gas authorities. He said it seemed to him an extraordinary thing that a Joint Committee of the two Houses of Parliament should be inquiring to-day into the creation of a monopoly for the chemical trade—a particularly prosperous one—at the expense of 6,500,000 consumers of gas in this country. A monopoly meant, naturally, the exclusive privilege of producing for sale some commodity or service; and monopolies still existed. Some were retained in the hands of a government, like the camphor manufacture in Japan and like our own Post Office in this country. There were in earlier times other monopolies, such as the Hudson Bay and the East India Companies. All these had, however, been swept away, and the only monopolies which existed to-day in this country by law were those which recognized the right in an author to the copyright of his work, or to a patentee of his patent; and these were justified by totally different principles, as the Committee knew, from any trade monopoly such as it was the object of the alkali manufacturers to set up. He should show that this was the claim of the alkali manufacturers—first, that the gas undertakings should not carry on trade which competed with them, if it were necessary to purchase any materials for the purpose of this trade; secondly, that gas companies should not purchase ammoniacal liquor and tar from other gas companies, because the alkali manufacturers and tar distillers wanted these things as their raw material; and, thirdly, that gas undertakings were to be restricted, although it would increase the price of gas to consumers. But the alkali manufacturers were even more audacious than this, because they demanded that many of the gas companies who had the power to deal in their residual products under Acts of Parliament should be prevented from doing so. This was made clear from Mr. Fitzgerald's reply to a question by the Chairman, when he said that not only should the proposed restriction be imposed in future legislation, but should be applied generally. He was thus going to take away the powers which a good many gas companies already possessed. Such a proposition seemed to him to merit the term monstrous. Mr. Fitzgerald had referred to this business as not a legitimate one. What did he mean by legitimate business? If he meant that the gas companies were doing something illegal, then he could stop them in the Courts of Law; but if what they were doing was legal, there had been no evidence placed before the Committee which would justify Parliament in saying that, although the power to do these things had been given and capital had been raised upon a parliamentary guarantee, it would be taken away. The whole of the claims of the alkali manufacturers turned upon the evidence of Mr. Pearce, who referred to what the Committees of Parliament had done only this year as the practice of Parliament. It was not the practice of Parliament; it was what two or three Committees had done this session—he thought, with great respect, erroneously. Further than this, Mr. Pearce in his evidence before the other Committees had merely quoted sulphur as the material in which gas companies should not be allowed to deal, and, in saying so, was selfishly forgetting all about chemical manufacturers. To-day Mr. Pearce did not restrict the market of the gas undertakings to sulphur, and now wished to apply the proposed restriction to all residual products of gas-works. But why on earth should the raw material of chemical manufacturers be protected from fair competition? This was all the gas companies asked for. If they could buy or sell cheaper than the chemical manufacturers, they would get the trade. They had heard from Mr. Carpenter that he had been tendering in competition with a manufacturer for the South Suburban trade, and had lost it in most years because the chemical trade had beaten him in price. But last year he had beaten the chemical trade, and got the contract. Was not this healthy competition? But Mr. Pearce wished absolutely to prohibit it. He had said in his evidence that he wished to put a limitation on the trade of the gas undertakings; and what was that except creating a restricted market for the benefit of Mr. Pearce and the other people in this prosperous alkali trade! In his cross-examination, Mr. Pearce had stated that even if the gas companies could show to the Committee that the proposed restriction would increase or keep up the price of gas, nevertheless Parliament should impose a restriction. He had never heard a more blatant attempt to induce a Committee of Parliament to put on restrictions for the benefit of one particular trade out of the pocket of the consumers of gas. Finally Mr. Pearce not only would like to restrict gas companies from dealing in their residuals in the way which he feared, but would even stop the working-up of residuals altogether; for he had stated in his evidence that unfortunately the alkali trade could not now object to gas companies working-up their own residuals, although if the chemical industry had been wide awake years ago they might have objected then. This was the attitude of the gentleman who was the principal witness for the alkali manufacturers. Quoting further from his evidence, Counsel referred to the argument that it was improper to suggest that the same form of words in the clause authorizing the manufacture of gas covered anything which might be done in the way of chemicals. In fact, Mr. Pearce said that Acts of Parliament really only referred to the supply of gas for lighting. Counsel, however, pointed out that heating was not specially mentioned in Acts of Parliament, and surely it was not suggested that gas companies should be prohibited from supplying gas for this purpose. After all, the supply of gas for heating purposes was of recent application, and was in active competition with coal merchants, who might, on the argument of the alkali manufacturers, oppose gas companies selling gas for this purpose. Would, however, the Committee listen for an instance to a coal company making such an objection? Again, take coke, which was a residual product and was sold direct to the public by the gas companies. It displaced, to a large extent, coal which would otherwise be consumed. Would Parliament listen to a restriction being placed upon a gas company prohibiting them from selling coke or purchasing coke from another company in order to meet the demand of their own customers? The real complaint seemed to be that Mr. Pearce was very angry because the Commercial Gas Company had sold sulphuric acid in competition with him. Mr. Fitzgerald had stated that gas companies could buy and sell as much as they liked to work up their own residuals; but he blew hot and cold. He said, first of all, that what the chemical trade feared was the growth in the future of the practices which were complained of, and then put to the various witnesses that as they were not doing it to-day, they could not be hurt by the prohibition. Why should not, however, these companies in the future do everything to reduce the price of gas? Under the sliding scale, the gas consumer and the shareholder were in partnership; but in the bargain the consumer was far more interested than the shareholder. The whole object of the alkali manufacturers was to put upon the gas consumers of this country a very heavy burden indeed, and to restrict trade which ought to be free. There were some persons—and he was not going to condemn them—who thought that there ought to be a certain amount of protection against foreign producers; but he had never heard of a responsible politician who suggested that there should be protection in the country itself for the benefit of one trade. The most rabid tariff reformer had never suggested this. But nevertheless it was the suggestion which was now being made to the Committee. Was Parliament to interfere to allow these great chemical firms to buy more cheaply, at the same time making us pay more for our gas? It was stated, quite truly, that ammoniacal liquor was the raw material of the alkali trade, and that if the chemical manufacturers could not get

ammoniacal liquor their trade would be gone. But why should they not pay a fair market price for their ammoniacal liquor and also tar? This was all the gas companies wanted. The fair market price must be one that was supplied by fair and free competition, not by what the Committee were asked to do—to create a ring by Statute, or by their report, in a trade where rings already existed at the present time. There had been ample evidence that there were agreements between the various manufacturers which had the effect of keeping up the price or having it reduced just as they chose. Reverting to what had been termed the practice of Parliament, Counsel said that in the cases heard this session, many of the companies had never manufactured any chemicals. They had come to Parliament for some privilege. In the case of the South Suburban Act, they were asking to amalgamate for some benefit that amalgamation would give them; and, as usual, Parliament, in return for giving privileges of this sort, had placed some restrictions upon the Company which they felt were applicable to this particular undertaking. The same thing happened with railway companies. For instance, this session the Midland Company acquired the Tilbury and Southend Railway Company. Other railway companies came before the Committee and alleged that they would be injured by the amalgamation, and Parliament granted the Great Northern Company running powers over the amalgamated lines. Nevertheless, this was not used as a pretence by the Great Northern Railway Company for securing running powers over all the railways in the kingdom. This was equivalent to what the alkali manufacturers were now asking. He did not know what determined Lord Ritchie's Committee to put the chemical clause in one Act, but that there was no practice of Parliament in this matter was evident from the decision of Sir Harry Samuel, in which he specifically stated that the insertion of the clause in that particular Act was not to be taken as a precedent at all, and further pointed out that there might be cases where small companies should combine in order to manufacture the residuals from each other's works. He contended that he had proved conclusively that this was frequently the case, and especially in Wales and Ireland. The Committee had been told that there were twenty different undertakings in South Wales running liquor to waste because they could not get a customer for it; and he contended that they could be formed into groups to manufacture the liquor and save the waste that was taking place. Was this good or bad? He should have thought it was an excellent thing; but the Committee were now asked to forbid it. He did not believe that Sir Harry Samuel confined his decision to small companies, because in many cases the small companies were the people who wanted to sell a particular article to a large company that had the necessary plant, and therefore every case must, to a certain extent, be determined on its own merits. Grouping in Wales and Ireland would, he believed, be an excellent thing. At the same time he asked the Committee not to put any restriction at all, because there might be a large company who had the plant and could manufacture for the small companies without forming any groups at all. The practice of Parliament was not uniform even in this session; and although Lord Ritchie passed a clause, it was totally different from that of Sir Harry Samuel.

The Chairman remarked that, of course, the practice of Parliament was not uniform; otherwise the Committee would not be sitting. What the Committee had to do was to settle the practice of Parliament for the future.

Mr. Balfour Browne thought that people had misunderstood the practice of Parliament, and that the anthorities of the Houses had acted prematurely in altering the Model Clause in order to make it in conformity with the decisions earlier in the session. Parliament had now arrived at the conclusion that the matter required further investigation; and therefore the Committee were not in any sense bound by what had been done this session nor by the suggestion made by Mr. Fitzgerald that the altered Model Clause should be the clause of the future.

The Chairman said the Committee were not in the least bound by either.

Mr. Fitzgerald agreed.

Mr. Balfour Browne, continuing his speech, said that, having tried to show what the alkali manufacturers case was, he would tell the Committee what the gas undertakings said. Their argument was that it was their duty to the consumer to cheapen gas by every means in their power; and as they could sell gas to one another—this was allowed by the Standing Orders—they claimed the right to deal with one another or outsiders, wherever they could get the cheapest article to enable them to turn their residual products to the best account. In other words, gas undertakings claimed the right of unlimited trade between themselves in the products of their industry, and the right to purchase anywhere all materials to be used in the preparation of their own products for the market. The Chairman of the Committee had asked more than once whether the gas undertakings claimed the right to purchase pyrites. If the Committee accepted his words as to their claim, it would prevent the purchase of pyrites for the manufacture of sulphuric acid for sale on the market; but it would allow them, if they were short of oxide of iron, to buy pyrites to make sulphuric acid for the gas industry. This, he ventured to say, was a fair claim, not only on behalf of gas companies and corporations owning gas-works in this country, but for the consumers of gas. What had he proved? He had proved that some companies like the Gaslight and Coke Company were entirely self-dependent, and could manage without buying or selling outside. Some were not in this position, and were buying from others; and others were such small works that it was not even within their financial capacity to put up sulphate plant, and, in consequence, if they could not get a purchaser for their ammoniacal liquor it would have to be wasted. He had also proved that the cost of preparing tar was in many cases prohibitive, because the cost of the plant was expensive. He had further proved that there were rings in the chemical trade, and that arrangements such as those entered into by Salford with Mr. Lord had served to break these up; and it was fair to assume that similar things would take place in the future. They had heard specific instances the previous day from Mr. Burton, Mr. Phillips, and Mr. Schultz of the manner in which the prices were kept low. Not content with making rings and districting, the chemical trade now asked Parliament to assist them to make further rings for their benefit. He had also proved in a great number of cases that no market could be found for the liquor, but that there were gas-works near which could take the liquor from those less fortunately placed, and that to do so would be to the advantage of all concerned. The other side put forward the claim that their raw material in the form of ammoniacal liquor was only produced by gas-works; but this was not the case, as the Committee now knew from the evidence of Mr. Gibb. This clearly proved that the market was not confined to gas companies, and that liquor can be obtained from a number of other people in the country. Mr. Fitzgerald, in this matter, was nothing if not inconsistent, because he was continually asking witnesses what would become of the alkali makers, who depended upon liquor for their raw material, if this was allowed to continue; and in the same breath he asked why did not the small undertakings work up their liquor. If they did this, What would become of the alkali people then? It did not make a bit of difference who deprived the alkali people of their liquor, if they were deprived of it; and if Mr. Fitzgerald thought all the small gas-works could erect sulphate plants, they would be deprived of their raw material just the same. In conclusion, Counsel said that the matter before the Committee was one of paramount importance, not merely to the gas undertakings of this country—it was a matter of vital principle. "I am standing here," he said, "as an advocate for Free Trade in this country."

Counsel's Speech for the Alkali Manufacturers.

Mr. Fitzgerald, at the commencement of his final speech for the alkali manufacturers, stated shortly what the claim of the chemical trade was in this matter, because, he said, it appeared to him that throughout the case the evidence of the gas companies had been largely directed against a case that had never been made on behalf of the chemical trade at all, and that the Committee had been asked by various witnesses to suppose that the proposal put forward by the chemical trade would interfere with the legitimate conversion of residual products, and would increase the price of gas very largely indeed. The proposal of the alkali trade was simply and shortly that gas undertakers should be confined in dealing with residual products to the working-up and conversion of the residuals resulting from the manufacture of gas by them. They would be able to convert their ammoniacal liquor into sulphate of ammonia; they could treat their spent oxide and make sulphuric acid; they could distil their tar and get (in the process) the various tar products that result from the distillation; and whatever they got in this way they could sell to the best advantage. The only limitation that he was asking for was that gas undertakers should be confined to their own residuals resulting from the manufacture of gas by them; and this he believed was the intention of Parliament always when the clauses from the various Acts which had been quoted, giving powers to sell and convert residual products, were inserted. The limitation now proposed did not interfere in the slightest degree with the manner in which the vast majority of gas undertakings were carried on at the present time. Of the small minority of gas undertakings which would be interfered with, there were only quite a few cases, and those apparently of large undertakings, which would be interfered with to any substantial extent; and even in these cases at the present day the interference would not affect to any substantial degree the income of the undertaking. The grounds on which he put forward this proposal were these: First, the alkali trade relied on the general principle which was to be found in the practice of Parliament for years with regard to statutory undertakings, that they were not to increase the sphere of their operations so as to bring them into competition with the ordinary trader; secondly, that it was unfair to the ordinary trader to allow these statutory bodies, who were possessed of a statutory monopoly for the supply of gas, and who, by the possession of that statutory monopoly, were assured of a large and certain income, to raise money at easy rates and go into competition with the ordinary trader in a matter which was far outside the primary and only reason for which they were established by Parliament; and, lastly, that it was not in the public interest that the ordinary trader should be driven out of the field, as he certainly would be unless there was some limitation of the powers of gas undertakers in this matter. Mr. Perry had stated that in regard to the highest form of the chemical trade—namely, the manufacture of high-class ammonia salts—it was absolutely necessary that the chemical manufacturers should have ammoniacal liquor, and if they were deprived of this source of supply this portion of the chemical trade throughout England would be simply transferred to Germany or the United States, or other countries which were in competition with us, as the gas companies had not taken up this part of the chemical trade. A great deal of evidence given by the gas companies was quite irrelevant. It would have been perfectly relevant if it were proposed to stop them trading in their own residuals. There had been a great deal of evidence about the advantage to poor people of being able to get a supply of coke from gas companies; but he had absolutely nothing to do with coke at all, nor had any one of his witnesses ever suggested that the gas industry was to be prevented from selling coke in any way they pleased. He was only concerned with the three residuals which were of importance to the chemical trade—namely, ammoniacal liquor, spent oxide, and tar. As a matter of fact, coke was the most valuable of all the residuals of the gas companies processes, as the revenue from it was enormously in excess of the income derived from all the other residual products put together.

The Chairman: I think the clause you ask for would prevent the re-sale by one gas company of coke bought from another.

Mr. Fitzgerald: It does not prevent the sale of anything.

The Chairman: It would prevent the purchase for the purposes of re-sale.

Mr. Fitzgerald: If the clause refers to coke, it does. But what I want to point out to the Committee is that, taking, for instance, the accounts for last half year of the Gaslight and Coke Company, their income was £308,000 from the sale of coke; from the sale of breeze, it was £25,000; from tar and tar products, £72,000; and from ammoniacal liquor and sulphate of ammonia, it was £118,000. So that the sale of coke and breeze was considerably in excess—nearly double that from all the other residuals put together. In regard to the sale of coke, we

have nothing at all to do with it. No doubt if you were asked to allow gas companies to have the unlimited power of buying coke from other gas companies for the purpose of re-sale, there are mercantile bodies in London who would have something to say upon it. The coke merchants might have a case to put before you; but so far as the chemical manufacturers are concerned, we have never interfered with coke. The only evidence before you with regard to the purchase of coke by one company from another is that it is occasionally required.

The CHAIRMAN: I quite agree; but still I want you to realize, as no doubt you do, that the present Model Clause would prevent one company from buying coke from another for the purpose of retailing it.

Mr. FITZGERALD agreed that this was undoubtedly so; but he wanted the Committee to clearly understand that the chemical manufacturers' interests which he represented in this matter—not merely alkali manufacturers but the chemical manufacturers generally, including tar distillers—had nothing to do with coke at all. It was entirely outside their case; but he did not suggest that any case had been made by the gas companies for taking coke out of the ordinary rule. It had never been suggested that the purchase of coke by one gas company from another was carried on except to quite a limited extent, and no concrete instance had been given where any inconvenience would be caused. A great deal of evidence had been given as to the value of residuals, which was considerable, and had increased largely in recent years so far as sulphate of ammonia and tar were concerned. The rise in the value of these residuals in recent years had been due to the development of the chemical industry, which had shown the various uses to which ammoniacal liquor could be put. If, therefore, the chemical manufacturers were to say that the gas companies should not deal with their residuals in future, and should not get the full value of their own residuals, they would be asking something that would expose them to very severe criticism indeed. But he had never asked for anything of the kind. Mr. Balfour Browne had put it to Mr. Carpenter that as the value of his residuals represented 10½d. per 1000 feet of gas sold, the price of gas would be affected to this extent if they were prevented from selling their residuals. In cross-examination, however, Mr. Carpenter admitted that he had never attempted to suggest that this would be so. What was the meaning of putting this before the Committee when nobody was suggesting that gas companies should be prevented from selling their own residuals? Then take Manchester. Mr. Kay was under the impression that the existing practice of the Manchester Corporation (by which they dealt with their spent oxide in the way he explained) would be prevented under this clause. Manchester sent their spent oxide to merchants, who extracted the cyanides and sent it back to Manchester, at a reduced price, in order that they might use the sulphur from it for the manufacture of sulphuric acid. This was a matter in which it was not proposed to interfere. Manchester, in doing this, were merely dealing with their own spent oxide in a particular way, in their particular case, which happened to enable them to utilize their own spent oxide to the best advantage. Counsel next asked the Committee to consider the London district, which was represented by the three principal witnesses for the Gas Companies—namely, Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. H. E. Jones—three gentlemen who might not inaptly be described as the chiefs of the gas industry in this country. The three Companies represented by these gentlemen had the supply of gas in London in their hands. How would the proposed restriction affect the trade of any of these Companies? It would only have the effect of checking a quite recent practice, which threatened the chemical trade of London with absolute extinction. Take first the Gaslight and Coke Company. In their Act of 1868 was the very limitation now proposed by the Model Bill clause of this year; and yet they had carried on their business since that time, and had established the great works at Beckton under this limitation. Within this limitation a few transactions had taken place with other companies—so small that Mr. Corbet Woodall was not aware of them when he gave evidence on the Birmingham Bill earlier in the year, amounting to only a few hundred pounds a year—so small as to be quite negligible. Under the particular limitation he had referred to, the Gaslight and Coke Company had been able to carry on their enormous business, and to make the chemicals, samples of which Mr. Corbet Woodall had shown to the Committee. He could not have had a better instance for showing that a great gas undertaking could be carried on quite successfully and most profitably, both for the consumer and the shareholder, under the very limitation which the chemical manufacturers were proposing in this instance. Coming next to the case of the South Metropolitan Company, what was found here? This Company did not buy any ammoniacal liquor at all; and, therefore, so far as they were concerned, the clause did not interfere with them in the least. During the past two years, and during that period only, they had bought tar from the South Suburban Company—one year to the equivalent of 10 per cent. of the whole of the tar they dealt with, and in the other year equivalent to 5 per cent.; so that, as far as tar was concerned, if the clause were passed, they would only have to give up this very limited practice, which had only occurred during the past two years. With regard to spent oxide, they had bought for about ten years from other gas companies; and during the last six years the quantity purchased from other companies had been inconsiderable. He believed Mr. Carpenter would agree that it represented about an average of 100 tons a year; and to this extent their trade in spent oxide would be interfered with. Mr. Carpenter had also indicated that, in addition to the spent oxide purchased from other gas companies, the South Metropolitan Company had been buying from other sources, and had been manufacturing sulphuric acid to a considerable extent beyond what the spent oxide from their own gas-works would have enabled them to produce. This was the practice which the chemical manufacturers objected to; and the Committee could see at once what the practice led to. It had only just been started. The present extent of it was not great; but the South Metropolitan Company were already supplying the South Suburban Company, and, in addition, were supplying ordinary manufacturers or works requiring sulphuric acid. Of course, if they were allowed to have unlimited powers in this respect, there was no end to what might happen. There was no reason why they should not in future manufacture sulphuric acid to any extent by buying spent oxide to any extent, and entering into competition with the ordinary trader, quite irrespective of their gas business. Mr. Honoratus Lloyd had made an application for the South Metropolitan Gas Company to be heard separately, which was grounded on the fact that they had special powers, and that they had spent a large amount of capital in securing these powers, which would be rendered obsolete and lost if the clause were passed. He personally had listened in vain for any evidence of this kind. It was perfectly clear that if the clause were passed it would interfere with the existing business of the South Metropolitan Company to a very small extent, and that none of the capital which they had invested would be lost. What the clause would do would be to restrain the growth of this business, which, on the evidence of Mr. Carpenter himself, the Company had no reasonable ground for desiring to go in for. Coming to the Commercial Company, this concern had sold their tar for sixteen years to the same firm under a sliding-scale, which they had found very satisfactory. If they looked at "Field's Analysis," it would be seen that the Company did remarkably well by so dealing with their tar. They did not buy either tar or ammoniacal liquor, but purchased spent oxide from four other companies of which Mr. Jones was also a Director or Chairman, and they made sulphuric acid, and sold it on a large scale. The proposed limitation did not interfere with their tar business nor with their ammoniacal liquor business at all; but it did interfere with their sulphuric acid manufacture, so far as it was manufactured from materials which were not produced in their own works. Therefore, the Committee had it in this way: Gaslight and Coke Company, no interference with their substantial trade; South Metropolitan Company, slight interference with their existing trade in tar, and a certain interference with their existing manufacture of sulphuric acid; Commercial Company, interference with their existing trade in sulphuric acid. With regard to the large number of Suburban companies which existed around London, so far as the evidence had gone, there was no interference at all in substance with their business. Mr. Corbet Woodall had certainly mentioned the case of the Tottenham Company, of which he was also Chairman, and stated that on one occasion the Company purchased some materials from another company. But this was the only case mentioned of any of these Suburban companies desiring to purchase, or actually having purchased, materials from another company. From this it would be seen that in London it was mainly a sulphuric acid question; it was also to some extent a tar question. The sulphate of ammonia or ammoniacal liquor question did not arise in London, or with any of the Suburban companies, because they all manufactured sulphate of ammonia.

The CHAIRMAN said he did not wish to interrupt Mr. Fitzgerald, or to change the order of his argument; but the Committee felt that the case of the small companies was different from that of the large London Companies, and no doubt Mr. Fitzgerald would deal with this aspect of the case.

Mr. FITZGERALD said he intended to do so, but thought he would deal with London as a special case presenting different features from those to be found in the Provinces. Continuing to deal with the London Companies, he again urged upon the Committee the importance of preventing an extension of what was at present going on. As an example of the possibilities, he mentioned that Mr. Jones was connected with some thirty companies, and was, therefore, in a most favourable position for carrying on this interdealing between the gas companies, to the detriment of the chemical trade. Some of the witnesses for the gas undertakings said they did not claim the right to buy pyrites in the open market for the purpose of making sulphuric acid for sale. He did not know whether Mr. Balfour Browne adopted this suggestion or not. But was there any sense in the distinction? If they could buy as much oxide as they liked from gas companies, what sense was there in saying that they should not buy pyrites in the open market for the manufacture of sulphuric acid? The fear of the private traders was that the position of the gas undertakings would drive them out of the field. How was this apprehension made less if the gas undertakings were to be allowed to purchase as much material from other gas undertakings as they pleased for the manufacture of sulphuric acid, but were to be restrained simply from purchasing pyrites or other materials in the open market? No one proposed to hinder gas undertakings from converting their spent oxide into sulphuric acid; and numerous witnesses had shown that the spent oxide produced in the manufacture of gas, if converted into sulphuric acid, would produce sufficient to enable the undertakings to deal with their own liquor, and convert it into sulphate of ammonia. The only witness who had suggested that this was not correct was Mr. Carpenter; but when his evidence was expanded, it was clear that the statement was made because his Company were using lime instead of oxide of iron to purify their gas, and that while this process was in use they would not produce sufficient spent oxide for their purpose. As an instance of the possible action which the large London Companies might take, Counsel said he would put a perfectly extravagant proposition. Supposing the Gaslight and Coke Company said they wanted to drive out from the market all the other firms dealing in sulphuric acid in London, in order to get the market into the hands of the three London Gas Companies. If, for the purpose of doing this, they made up their minds to lose £40,000 a year, it would, as had been stated in evidence, increase the cost of gas to the extent of one-third of a penny per 1000 cubic feet sold. This would have absolutely no effect upon the financial position of the Company. Putting what he termed a perfectly practicable possibility—namely, that the Company should make up their mind to lose £10,000 a year upon their sulphuric acid business in order to get the market—this would have the effect of reducing their total income by ¼ per cent. How could the ordinary manufacturer stand up against these large Companies who were in such a position? If it were done, the ultimate result would be a ring of the three Gas Companies, who could, between them, fix a price for sulphuric acid, and probably district the London area between them.

Mr. THORNE: You do not suggest that anything of this kind has been done already.

Mr. FITZGERALD said he did not suggest that any London Gas Company were now losing £10,000 or £40,000 a year for the purpose of driving the ordinary manufacturer out of the field. His suggestion, however, was that the sulphuric acid manufacturer, the tar distiller, and the chemical trade were combining now, when a practice was just

beginning, which might lead to what he had suggested. An example was with regard to the manufacture of anhydrous ammonia in London; the evidence having shown that the Gaslight and Coke Company had forced the several manufacturers who used to make this to cease the business, and the Company were now the only one manufacturing in this country. What had happened in this connection would certainly happen with regard to the manufacture of ammonia salts generally. Mr. Carpenter's evidence with regard to the prices of sulphuric acid also suggested that, having discovered the price which the South Suburban Company were paying, the South Metropolitan Company immediately reduced their price by 10s., and got the contract from Messrs. Spencer Chapman and Messel. He certainly did not think that Mr. Carpenter's explanation of the manner in which the price was suddenly reduced—namely, the construction of the new acid plant—was a satisfactory one. He was driven to the irresistible conclusion, both from the answers of Mr. Carpenter and the figures he handed in, that, having ascertained what price was quoted by private makers, he had undercut them. He did not think any reasonable practical business man could have any doubt that this was so, and that it was part of a scheme to get into their hands the business of the South Suburban Gas Company. This showed very fairly the kind of thing that would go on. It was the first instance. But why should it not go on with every single Suburban gas company, at any rate, on the south side of London? The same was the case with the Commercial Gas Company, not by undercutting, but by the fact that Mr. Jones was Chairman or Director of four other companies. The Commercial Company had taken the business of these companies away from private traders, and were now supplying them. Similarly, as the South Metropolitan Company had supplied in the open market, what was to prevent the Commercial Company doing the same thing, and extending their operations far beyond the four gas companies now being supplied? A telling instance, demonstrating that what was proposed was not an interference with the legitimate trade of gas undertakings was the case of the Wandsworth Company, of which Mr. Jones was Chairman. This Company was one of the largest Suburban gas companies; and if the success of a gas undertaking depended on the selling of gas at a low price to the consumer, and paying the shareholder a satisfactory dividend, then the Wandsworth Company stood at the head of the whole of the gas industry in the London district, because they were supplying at 1s. 9d. per 1000 cubic feet, against 2s. 2d. by the South Metropolitan Company, 2s. 4d. by the Commercial Company, and 2s. 7d. by the Gaslight and Coke Company. The point was that Wandsworth did not work up their residuals, and never bought anything. Therefore, their trade would not be interfered with in the slightest degree, and the conditions under which they were able to supply the cheapest gas in London would remain just as before. Furthermore, the Wandsworth Company had agreed to accept Lord Ritchie's clause when their Bill was before Parliament this session. [This statement of Mr. Fitzgerald's was again objected to. It has been mentioned before in the proceedings, and the correspondence on the matter between the Agents has been placed before the Committee. The Agents for the Bill claim that they accepted the clause with the reservation that they should have the right to re-open the matter at any time after this session.] Yet the Chairman of the Wandsworth Company (Mr. Jones) now came to protest against the very limitation which he had accepted in an earlier part of the session. Dealing with tar, the matter was within a very small compass. The only one of the London Companies treating tar was the South Metropolitan Company, and this only to a comparatively small extent for the last two years. Mr. Jones, however, had indicated that he might like to go into the tar trade; and inasmuch as the South Metropolitan Company began in a small way with regard to their sulphuric acid business, so might this Company expand their trade in tar. Tar had been going up in price considerably, not because of anything the gas undertakings had done, but because of the enormously increased demand for it for road making. Mr. Maybury had been called to show that, by dealing direct with gas undertakings in his tar purchases, he had been able to save about £4000 a year; but there was nothing in the limitation proposed which would interfere with what Mr. Maybury had been doing. Turning from the London district to the country generally, Counsel said the first thing that must have struck the Committee was that, so far as municipalities were concerned, it did not appear from the evidence that a single one of them was carrying on the sort of business to which objection had been raised. Birmingham sold the whole of their residuals; Glasgow, he believed, did the same; and the proposed limitation would not interfere with the manner in which Manchester and Salford were now carrying on their trade. There was no evidence that any of the other large undertakings, such as Liverpool, Bristol, or Newcastle, would be interfered with in any way by what was proposed. Apparently, only 29 out of 41 gas companies were now purchasing residuals.

Mr. PADDON called the attention of the Committee to the fact that these 41 replies were the only ones received, and that they did not represent the total number.

Mr. FITZGERALD replied that circulars were sent out to 1650, and apparently there were not more than 29 who were dealing in their residuals in the manner complained of. From Mr. Shadbolt's table, it was seen that the undertakings which bought liquor from other gas-works had never been asked whether they could have disposed of it elsewhere if they did not sell it to the gas companies. Coventry was a great exception, and was exactly a case of what it was anticipated would be done in the future, if unlimited trading were allowed. Coventry had gone into the business just as an ordinary trader in dealing with residuals purchased from gas companies. They were buying liquor from eleven other companies, and simply concentrating it and selling it again. Very much the same thing was being done with sulphuric acid. Coming to the case of the small companies, he could not help being a little amused at the way this had been put forward by the three witnesses who were really representing the three London Companies. What had the Gaslight and Coke Company done for the small companies? Mr. Carpenter was really fighting fiercely for continuing what he was doing himself. Again, what had Mr. Jones done for the small companies? The case of the small companies was almost entirely a hypothetical one. He did not suggest that there might not be instances where a small company in some out-of-the-way part of the country was near a larger company, and could sell its liquor in this way. But he did not think that any such case had been put before the Committee; and the whole suggestion of the advantages of the combination of small companies was a purely hypothetical one.

Mr. ROBERTS, referring to Sir Harry Samuel's decision on the Annfield Plain Bill, and the statement there that there might be special circumstances in particular cases, asked Mr. Fitzgerald whether he read this to mean special cases with regard to small companies only, or to all concerns.

Mr. FITZGERALD replied that he meant that in some individual instances there might be special cases; but no special instances were proved before the present Committee. He was of the opinion that Sir Harry Samuel was merely guarding the question that in certain cases there might be special circumstances; and in this event his decision was not to be taken as a binding precedent. The Committee here, however, were asked to lay down a general principle in connection with gas legislation; they were not asked to legislate for exceptional cases, or to make recommendations about special cases until the special cases arose. Where a general parliamentary principle was laid down, there were always exceptional cases which might arise; and it was common in Private Bill legislation that a special case might arise which took it out of the general rule. When such special circumstances were proved, and a Parliamentary Committee were satisfied that the general rule ought not to apply, then the case was taken out of the general rule. Here, however, the opponents were asking the Committee to say that the general principle was not to apply at all. It was not to be laid down or applied in the case of nineteen-twentieths of the gas companies who had no special circumstances. Counsel next dealt with Mr. Balfour Browne's contention that the Committee were asked to sanction a monopoly in favour of the chemical trade. His learned friend could not have considered what a monopoly was when he made this statement. A monopoly was the exclusive right to deal in any particular commodity. But how could it possibly be said that, by forbidding statutory monopolies from entering into some other class of business, the Committee were thereby creating a monopoly in favour of the trade. There was no monopoly, for the simple reason that there were too many firms competing among themselves. Mr. Balfour Browne might just as well have said that the Court set up a monopoly in favour of the coal trade when it prevented the railway companies dealing in coal, or in favour of the electrical fittings trade when the Leicester Corporation were prevented from dealing in electrical fittings. There had been repeated suggestions as to rings and combines in the chemical and tar trades. But what was the evidence? His own witnesses had told the Committee that it was no part of the Associations concerned to regulate prices; while the evidence of the gas authorities with regard to Mr. Lord and Salford was peculiar, inasmuch as, if there had been any combine, Mr. Lord had broken it down. Mr. Lord had tried to do the same thing with the South Metropolitan Company; but Sir George Livesey was a wary old bird, and Mr. Lord did not succeed in putting any salt on his tail. Furthermore, Mr. Lord was in the Committee-room throughout the whole proceedings, and had not been called by the other side.

Mr. PADDON said that Mr. Lord must have been present out of personal curiosity, as he had not been asked to come by his clients.

Mr. FITZGERALD, continuing, said it was common in all businesses for merchants and dealers to accommodate each other by not definitely quoting and undercutting where they knew another firm already had the contract; and no doubt it was equally common among gas companies. As to other sources of supply of ammoniacal liquor, he still maintained that the only commercial source was from gas-works. If this were taken away, the business of the chemical manufacturer in ammonia salts would go—in fact, it had in part gone to America and Germany already. Was it in the least desirable that the ammonia salt trade should be taken away, as it would be if gas companies were allowed to buy up residuals from any gas company they liked? Mr. Balfour Browne had said that if all gas companies made sulphate of ammonia the chemical manufacturers would lose their supply of liquor just the same; but the answer to this suggestion was that the gas companies had been going on for a hundred years, and it had never been done, and undoubtedly in future, as in the past, it would pay gas companies better to sell their liquor to ammonia salt manufacturers than to convert it. Again, in spite of the evidence of Mr. Doig Gibb, it was clear that coke-ovens and the like made sulphate of ammonia direct, and that ammoniacal liquor was not commercially available from these works. The great prosperity of the gas industry, which had become even more prosperous since the competition of electricity had stirred up those concerned, was all due to the fact that gentlemen like Mr. Corbet Woodall, Mr. Carpenter, and Mr. Jones had devoted their energies, not to the manufacture of chemicals, but to the cheapening of gas, and by improving appliances for lighting, for heating, and for power. The large London Gas Companies were paying dividends of 10 to 16 per cent., and against this were dividends of 2 per cent. by the United Alkali Company, and who had paid no dividend at all for many years. Mr. Pearce's firm had paid 10 per cent., and Messrs. Chance and Hunt 5 per cent. But these were exceptions. It was under all these circumstances that he asked the Committee to say that the Model Bill clause, as amended, was a proper limitation on the business of gas undertakings. It was a very simple clause and perfectly clear, and, in his opinion, met the case. It confined gas undertakings to the working-up of residuals produced by them from the manufacture of gas by them; and this was the object of Lord Ritchie's clause.

The CHAIRMAN: The Model Clause, as I understand it, would not allow a gas company to buy sulphuric acid from another gas company for the purpose of working up its own ammoniacal liquor—in fact, I am not sure that it could buy sulphuric acid in the open market for the purpose.

Mr. FITZGERALD argued that the Model Clause would not prevent a gas company from buying sulphuric acid from another company provided the acid was made from the spent oxide of that company.

The CHAIRMAN: But would not the buying company be selling that which would not be a product of the gas manufactured by them?

Mr. FITZGERALD replied that sulphuric acid was not a residual. The residual was spent oxide, to which something had to be added

to produce sulphuric acid. He did not see anything in the clause to prevent a gas company manufacturing sulphuric acid from their own spent oxide, and, having manufactured it, selling it to anybody.

The CHAIRMAN: So far, I agree. But when a gas company has bought that sulphuric acid, and applies it to its own liquor, what is the resulting sulphate? It is not a product resulting from the manufacture of gas by them, but is a product which is the joint result, partly of their own residuals and partly of a purchased article.

Mr. FITZGERALD: If you look at the words, they are "may convert, manufacture, and sell all residual products resulting from the manufacture of gas by them."

The CHAIRMAN: But does that carry with it the implied right to buy all the materials necessary for conversion?

Mr. FITZGERALD: I think so.

The CHAIRMAN: I confess I do not.

Mr. FITZGERALD said it gave power to convert the residual products. Sulphur was a residual product; and it was desired to turn it into sulphuric acid. For this purpose, nitric acid, or whatever was necessary, could be purchased. This was a conversion of the residual product; and having converted it, the gas company could sell it. He thought the word "convert" had the same meaning as "work-up" in Lord Ritchie's clause. The authorities of the House who framed the Model Clause kept the word "convert," because it was the word commonly in use before.

The CHAIRMAN pointed out that in Lord Ritchie's clause there was an expressed right to buy materials for working-up the gas company's own products; and he did not see at present how the word "convert" in the Model Clause imported the same meaning, or gave an implied right to buy materials which a gas company required for working-up their own products.

Mr. FITZGERALD said that his opinion was different. He considered that the words must be read as being the same meaning as the word "convert." He did not see how they could convert residual products without doing something to them; and he had no doubt whatever that it was the intention of Parliament that gas undertakings should buy all the things necessary for converting their residual products.

The CHAIRMAN: When you say you base your case on the Model Clause this year, you do not put that any higher than the effect of Lord Ritchie's clause, and that in your mind the two clauses mean, on this point, the same thing.

Mr. FITZGERALD: I think they are intended to deal with the same thing; but I am bound to say I consider the Model Clause is much simpler and better expressed.

The CHAIRMAN: All I want to know is that while you base your case on the Model Clause, as against Lord Ritchie's clause, that does not represent any change of policy on your part, and that you still say a gas company should be allowed to buy materials for the working up of their own residuals.

Mr. FITZGERALD: Yes. Speaking generally, he continued, and looking at the frame of the clauses usually inserted in Gas Bills, the real intention of Parliament was to give gas undertakers power to deal with the residuals produced in the manufacture of gas by them. There never was any intention on the part of Parliament to enable them to deal in residuals generally, and buy them up all over the country. He was convinced that no Committee of Parliament had ever sanctioned a thing of this kind intentionally, and that no gas company had ever come to Parliament and said they wanted powers to do what the South Metropolitan Company or the Coventry Corporation were now doing. The primary object of a gas company was the supply of gas; and this was the only reason why they had been given statutory powers, and had been incorporated by Parliament. He invited the Committee to say, on the evidence before them, that the restriction proposed was a reasonable and proper limitation of the powers of gas companies, and ought to be imposed in accordance with parliamentary principles for the protection of the ordinary trader. Counsel concluded by thanking the Committee on behalf of himself, the Counsel on the other side, and all parties concerned, for the great attention which they had given to the case.

The CHAIRMAN intimated that the Committee would report to Parliament in due course.

The next meeting of the Committee—in private—for the consideration of their report, will be to-morrow (Wednesday).

High-Pressure Street Lighting in Leeds.

It may be remembered that some eighteen months ago the Gas Committee of the Leeds Corporation obtained permission to fix an experimental installation of high-pressure lamps in one of the main thoroughfares. In due course, it was carried out, and gave very great satisfaction to all who saw it. The general oversight of the installation—the lighting, cleaning, &c.—was kept in the hands of the Committee. As the trial had been going on for upwards of twelve months, the Committee recently approached the Public Lighting Committee with a view to the latter taking over the installation. This request came before the Committee (a new one with a fresh Chairman) at their first meeting; and, according to a paragraph in the "Yorkshire Post," they asked the Gas Committee to remove the lamps within a month, as they considered the system to be too costly. The Gas Committee, however, were able to show that some serious miscalculations had been made—no account having been taken of the alternate lamps being extinguished at midnight. They were also in a position to prove that for a less sum than that required for the suggested electric lighting of the streets in question they were giving nearly four times the candle power. The minute of the Public Lighting Committee came before the City Council at their last meeting, and was referred back. In the course of an interview on the subject with a representative of the above-named paper, the General Manager of the Gas Department (Mr. R. H. Townsley) expressed the hope that some arrangement would be come to for preserving the system. The Public Lighting Committee, he remarked, did not dispute the fact that the new lighting had been a success. The question was one of terms; and he thought the matter would eventually be satisfactorily settled between the two Committees.

MISCELLANEOUS NEWS.

PROPOSED GAS-WORKS EXTENSIONS AT SALFORD.

An Important Scheme.

The ratepayers of Salford will shortly be called upon to face proposals for the expenditure of £525,000 upon their gas and electricity undertakings—£275,000 being required for the extension of the gas-works. The immediate expenditure proposed by the Gas Committee upon the new scheme is, however, only £119,000. The matter was dealt with early last week in two articles in the "Manchester Courier," from which we extract the following particulars.

On the 4th of September last, the Gas Committee recommended the purchase from the Earl of Ellesmere of 38,790 square yards of land for gas-works purposes, at a total cost of £53,000; and the Council referred the matter back to the Committee with an instruction to obtain the opinion of competent valuers as to the price, terms, and conditions of the proposed purchase. In order to justify their position, the Committee submitted to Mr. Corbet Woodall, M.Inst.C.E., D.Sc., and Mr. E. H. Stevenson, M.Inst.C.E., the following questions:

(*a*) Is an extension of the gas-works necessary?
(*b*) If so, what extension is necessary, and are any alterations in the existing works possible and desirable for such extension?
(*c*) If alterations of the existing works are not possible and desirable, is the plot of land referred to the most suitable site for extension, having regard to all circumstances of the case, particularly to the terms and conditions of sale, and to the fact that the Corporation have power to use it for this purpose?
(*d*) If not, what other land within the area of supply is suitable?

In a report submitted to the above-named gentlemen by Mr. W. W. Woodward, the Gas Engineer to the Corporation, the probability of a large increase in the sales of gas in the Salford area during the next few years is emphasized, on the grounds that the provisions of the Provisional Order of the present year will, on the 1st of April next, automatically reduce the price of gas in the out-districts supplied by Salford by 5d. per 1000 cubic feet in the Irlam and Cadishead area, and by 2d. per 1000 cubic feet in the Worsley and Prestwich areas; that a general reduction in the price of gas to all consumers will be recommended throughout the area of supply from April 1; that prepayment meters be supplied in the out-districts; that a reduction by more than one-half in the hiring rates of gas-cookers is to be recommended; and that shortly gas-fires may be let out on hire.

Mr. Woodall, according to the "Courier," has reported that an extension of the gas-works is necessary, though the output of gas last year was less than the maximum, which was reached in 1908. Fluctuations in demand, he says, are by no means unusual; and the recommendations of the Gas Engineer will tend to increase the demand. He also expresses the belief that extensions are necessary to the storage plant, and that more space is required for the stacking of coal and coke. Certain alterations at the various gas-works are suggested; and the opinion is expressed that the proposed site "is the most suitable that could be found for the purpose."

Mr. Stevenson, while being of opinion that the history of the last ten years, during which the Salford gas undertaking has not increased at the average rate of growth of all the undertakings in the United Kingdom, does not justify launching out into the expenditure of initiating new works, regards the extension of the gas-works as necessary in view of Mr. Woodward's recommendations. He adds that a comparatively fair expansion of the undertaking may be expected in the future, and that land must be obtained for the increase of the coal storage and for one or more gasholders; and he considered the Corporation would be wise to acquire the proposed site.

The Committee have made a report upon the subject, at the close of which they say: "The increased cost in standing charges, on account of the expenditure on the proposed extension, will not increase the price of gas. The average amount of gas profits applied during the past ten years in relief of rates has been £26,974 per annum. The Council are aware that the Salford Order, 1912, reduces the amount which can be so applied to £12,089 per annum. The difference is £14,885. Assuming the same average profit per annum for the next ten years, this amount would have in future to go in reduction of the price of gas, save and except £7000, which can be accumulated in a reserve fund; thus leaving £7885 per annum to go in reduction of the price of gas. But the interest and sinking fund on the proposed expenditure of £120,000 on a thirty years' borrowing is only £6826 per annum. It will thus be seen that the annual expenditure on the loan required will not increase the price of gas, but will come out of the £7885, and still leave a margin available for a reduction in the price of gas; and it should not be forgotten that the out-districts will contribute a share of such interest and sinking fund. Moreover, the saving in the cost of manufacture of lower candle power gas, as authorized by the Salford Order, 1912, will in itself meet the new expenditure on the loan proposed. Apart entirely from the fact that if the sale of gas increases as anticipated, there will be an additional revenue therefrom."

The following is an estimate of the cost of the scheme for complete works equal to carbonizing 600 tons of coal per day:—

Land, including payments for paving charges, buildings and plant upon the land, boundary walls, contingencies, &c.	£53,000
Manufacturing, purifying, and storage plant, clearing site, drainage, entrance gates, &c.	15,300
Carbonizing plant, including retort-houses, storage-hoppers, machinery, &c.	92,200
Condensers, purifiers, station meters and mains, &c.	43,900
Gasholder and tank	51,000
Boilers, exhausters, locomotive, tar and liquor pumps, &c.	15,500
Workshops, subway, gas and water mains and fittings, &c.	3,100
Total cost of land and works	£275,000

TRADING PROFITS IN AID OF RATES.

Proposals at Manchester and Stockport.

There was a further discussion at last Wednesday's meeting of the Manchester City Council on the report of the Trading Profits Special Committee; but in view of the importance of the subject, it was finally agreed that the consideration of the matter be adjourned to the next gathering of the Council.

As already reported in the "JOURNAL," the Committee proposed that for a period of three years the contributions from the trading departments (based on capital expenditure) in relief of rates should be as follows: Gas Committee, 1¾ per cent.; Electricity Committee, 1 per cent.; Tramways Committee, 5 per cent.; and Markets Committee, 2 per cent. On this basis, the amounts to be handed over would be very much the same as they are for the present financial year—gas accounting for £50,000, electricity for £24,500, tramways for £100,000, and markets for £10,000.

Opposition to the Committee's proposals came from different quarters. Mr. O'Loughlin argued that the grants in aid of the rates as laid down would tie the several Committees' hands against improvements. Mr. Taylor pointed out that Parliament had of late shown its hostility to the present system, under which large sums were taken from gas undertakings in relief of rates. A reduction in tram fares, he added, cheaper gas, and the provision of gas-cookers in the houses of the poor, were preferable to the accumulation of profits. Mr. M'Lachlan submitted that the poorer section of the community did not want preferential treatment, but justice; and they were not receiving justice when they had to pay more for gas and tramway rides than they ought to do, and when they were debarred from using electricity, because the trading profits of these concerns were drawn upon for the rates. At present, the poorest users of gas were charged 30 per cent. more than those who paid for it quarterly.

On the other hand, Alderman Holt supported the proposals of the Special Committee; being of opinion that the scheme was on fair and business-like lines. Mr. James Johnston suggested that if a levy was to be made on the trading profits for rate relief, it should not be more than 2 per cent. on the capital standing to the account of any department. He also contended that more benefit would accrue from a reduction in tramway fares and the price of gas and electricity than from a reduction of the rates by means of the trading profits.

A proposal that "at the end of the financial year 1912-13, before any of the profits of the Gas Department are allocated, a financial statement of the result of the year's working be submitted to the Gas Committee," gave rise to some discussion at last Wednesday's meeting of the Stockport Town Council. Under the present arrangement, the Chairmen of trading Committees of the Corporation in the early part of March each year are consulted by the Finance Committee as to the amount likely to be available out of profits in aid of rates; and upon this information the preliminary estimates are based. It was the argument of supporters of the proposed change that the whole of the members of the Gas Committee should have an opportunity of discussing what sum should be offered in relief of rates, instead of the matter being left solely to the Chairmen. On the other hand, it was pointed out that the proposal was not practicable, and that, as a rule, the Committee were consulted before any amount was named to the Finance Committee. In his reply upon the discussion, Alderman Fernley, the Chairman of the Gas Committee, said in this matter he had followed the custom of his predecessors. He had never during his chairmanship allocated anything to the relief of rates without the sanction of the Committee; and he declared, without fear of contradiction, that there was no Chairman of any Committee of the Corporation who did less without consulting his Committee than he did. On the matter being put to the vote, 22 members were for the proposed change and 27 against it.

UNREST AMONG MUNICIPAL EMPLOYEES.

Gas-Workers' Threatened Strike at Macclesfield.

In a number of Lancashire and Cheshire towns there has been a recrudescence of unrest among municipal workers, with threats of strikes unless demands for altered conditions of employment and advances in wages are conceded by the local authority. In some cases, a good deal too much has been made by the newspapers of the possibilities from a strike of gas workers; this being particularly so at Macclesfield. Here the whole of the men employed at the gas-works have handed in a fortnight's notice to cease work, unless in the meantime they are conceded an all-round advance. The question has been discussed on many occasions since April last; but no settlement has been arrived at between the Corporation and the men's leaders. The demands of the men are as follows: Stokers, 5s. 9d. a shift, equal to an advance of 4½d. a shift, and a week's holiday each year with pay; lamplighters, 25s. a week, an increase of 4s. weekly, coats and leggings, and a week's holiday with pay; labourers, a minimum wage of 25s. weekly, an advance of ¾d. an hour; coal-wheelers, 5s. a shift during winter months, and 4s. 6d. in summer—an advance of 3d. a shift. The Corporation offered an advance of 1½d. a shift to stokers, 1s. 6d. a week to lamplighters, and labourers a recognized rate of 5d. an hour, equal to an increase of 1s. 8½d. per week. This offer was rejected by the men. A meeting of the General Purposes Committee of the Corporation has been called to consider the position.

The minutes of the Gas Committee of the Manchester Corporation, submitted for confirmation at last Wednesday's meeting of the City Council, contained a record to the effect that an application from the Joint Committee of Engineering and Kindred Trades for an advance of wages for workmen had not been entertained. Mr. Greenall, who moved that the matter be referred back for further consideration, said the increase asked for (2s. a week) had been conceded by other Committees. Mr. Hague, in supporting this, stated that the advance was one on present rates, and not on the minimum wage. Many of the workmen employed in the Gas Department, he added, were paid more than the minimum wage, for the reason that the Corporation had the pick of the men in the trade. Following a somewhat heated argument, consequent upon accusations as to certain members being paid agitators of labour, Mr. W. Kay, the Chairman of the Gas Committee, asked the Council to take upon themselves the responsibility of dealing with this question, and not send it back to the Committee. He said the Gas Department were now paying 2s. above the majority rate paid to similar men doing similar work in private shops in the city. The amendment was rejected by 73 to 25, and the minutes confirmed.

The municipal employees at Stockport are threatening to strike work unless the Corporation concede their demands, which include a minimum wage of 25s. per week for all Corporation workers. The men allege that at the conclusion of the last strike it was agreed that a minimum wage of 25s. should be established, and that in certain departments this had not been carried out. As to the gas-workers, they have formulated fresh demands, embracing a readjustment of hours and an increase of wages to men in various departments. The Gas Committee considered these demands at a special meeting held last Wednesday evening, and sat until a late hour discussing them. A deputation representing the men was received by the Committee. No definite decision was arrived at; the Committee resolving to hold another meeting before giving their reply to the men's union.

The Gas Committee of the Leigh Town Council have conceded the application made by the Secretary of the Bolton and District Gas Workers' Association for an increase in the wages of the stokers at the gas-works by 3d. per shift; the advance to take effect as from the 12th inst. At present the men get 5s 6d. per day during December and January; and in the other months of the year, 5s. 3d.

ELECTRICITY SUPPLY IN LONDON.

Return by the London County Council.

There has just been issued a return made to the London County Council by the Assistant Statistical Officer (Mr. J. C. Spensley) on the supply of electricity in and around London for the year 1910-11. It gives the names of the various authorities working under the Electric Lighting Acts 1882 and 1888, with the authorized area of supply; an analysis of the accounts of each undertaking for the year ended March 31, 1911, or Dec. 31, 1910; and miscellaneous statistics as to the capacity of the works, the output of current, the average prices obtained, &c. The total amounts borrowed by the Borough Councils for the supply of electricity at the date of the return were £6,402,272; the total paid-up capital of the Companies being £13,899,231—making together, £20,301,503. The net capital expenditure was: Councils, £6,424,766; Companies, £14,339,623—together, £20,764,389, or an overdraft of £462,886. The total revenue was: Councils, £784,720; Companies, £1,663,715—together, £2,448,435. The expenditure of the Councils (excluding rates and taxes) was £334,266; that of the Companies, £642,769—together, £977,035. The total number of units sold was: Councils, 87,599,320; Companies, 143,569,982—giving a total of 231,169,302. The figures for the extra-London undertakings are: Municipal Corporations and District Councils, 64,435,833; Companies, 26,815,030. Deducting 3,114,602 units purchased by the Willesden Council and 62,891 units by the Foots Cray Company, the total quantity of electricity sold outside London was 88,073,370 units. The average price per unit in London generally was 2·48d.; while the price for private supply was 2·61d. The following figures show the average prices obtained for current supplied for various purposes:

	Councils.	Companies.	Average of the London Undertakings.
Street lighting . . .	1·54d.	1·48d.	1·53d.
Other lighting . . .	3·21	3·50	3·42
Power and heat . .	1 07	1·24	1·16
All purposes. . . .	2·05	2·74	2·48

The average for all purposes of the extra-London undertakings in the hands of local bodies was 1·93d. per unit, and of the companies 2·02d. per unit.

Augmentation of the New York Gas-Works.

The "Intercolonial Gas Journal of Canada," referring to the above matter, says: "The recent completion of the first half of unit No. 2 of the Consolidated Gas Company's plant at Astoria (N.Y.) marks another milestone in providing for New York the largest single gas plant in use anywhere in the world, as well as the most economical producing plant, owing to this very magnitude of operations. The first unit completed produces 20 million cubic feet of gas daily; and the half of unit No. 2, which has just been completed, has a capacity of 20 millions more. The entire nine units of which the plant is to be composed will have a productive capacity of 250 million cubic feet of gas daily. The enormous capacity can be realized when it is borne in mind that at present the total consumption of Manhattan and the Bronx is 110 million cubic feet. The entire plant, when finished, will be larger by far than the giant gas plant of London, which supplies the Metropolis of the world. Each unit is a manufacturing city in itself, constructed at a cost of from $10,000,000 to $12,000,000; and the entire plant, it is estimated, will represent an outlay of from $80,000,000 to $100,000,000. It will spread over an area of 350 acres. Unit No. 2 is to be devoted to the manufacture of water gas, and is fed by coke, a bye-product from unit No. 1, in which gas is produced from anthracite coal. Unit No. 2 consists of one generator-house, 85 ft. by 211 ft., and 10 feet high.

Last Sunday week, there were a series of gas explosions in Wrexham Street, Mold, in consequence of an extensive fracture in the main under this thoroughfare. The escaping gas found its way into the buildings on both sides of the street, with the result that damage was caused in several instances. The fire brigade and the employees of the Gas Company were, however, quickly on the spot, and prompt measures were taken to prevent an extension of the trouble.

PROFIT-SHARING AND CO-PARTNERSHIP.

A Board of Trade Report.

The Labour Department of the Board of Trade have issued, over the signature of Mr. G. S. Barnes, a report on profit-sharing and labour co-partnership in the United Kingdom, as the result of an investigation which was at the outset entrusted to Mr. D. F. Schloss, who, it is pointed out, was eminently qualified to undertake this duty, and, in fact, compiled the last detailed report (published in 1894) issued by the Department on the subject of profit-sharing. Unhappily, however, before completing his latest investigation, Mr. Schloss fell ill, and his death ensued a few weeks ago. The volume before us consists of an introductory report, a statement of the scope of the inquiry, sections on (1) profit-sharing and co-partnership in private firms and companies, (2) profit-sharing and co-partnership in co-operative societies, and (3) conversion of ordinary businesses into co-operative societies. There are also numerous appendices and an index. The main portions of the general report and the statement dealing with profit-sharing in gas-works are reproduced below.

General Report.

The last detailed report issued by the Department on the subject of profit-sharing was published in 1894. The Department have endeavoured, by annual inquiries, to keep up to date the information contained in that report, and have published the results of these inquiries in the "Board of Trade Labour Gazette" and in the "Abstracts of Labour Statistics." But it is clear that the time has now come for another general survey of the whole subject. In this report, as in the previous one, profit-sharing is understood to involve an agreement between an employer and his workpeople, under which the latter receive, in addition to their wages, a share, fixed beforehand, in the profits of the undertaking. A grant or bonus, therefore, made at the absolute discretion of an employer, and not upon any pre-arranged basis, is not a case of profit-sharing for the present purpose. It may further be remarked that, without a special inquiry, it would be difficult to determine in the less well-organized trades, in which many of the profit-sharing schemes have been started, whether the wages paid are the full current district rates.

Labour co-partnership is an extension of profit-sharing, enabling the worker to accumulate his share of profit in the capital of the business employing him, thus gaining the rights and responsibilities of a shareholder. A still further stage is found in some co-partnership schemes which provide for a direct share in the management as well as a share in the profits; one or more seats on the board of directors being expressly reserved for representatives of the workpeople. The present investigation has brought to light a large number of profit-sharing schemes in private firms and companies which were not mentioned in the 1894 report; and the number of schemes now known to be in operation is 133, the number of workpeople employed by the firms having such schemes being about 106,000. These 133 schemes are the survivors of nearly 300 profit-sharing arrangements, of which 163 have been abandoned.

The following tabular statement classifies the schemes according to the date of adoption, and shows the extent to which schemes started at various periods have survived:—

Date of Starting.	Total Number of Schemes.	Schemes Abandoned.	Schemes still Existing.	Schemes as to which no Recent Particulars are Available.
Up to 1870	20	17	3	—
1871–1880	18	12	6	—
1881–1890	84	63	20	1
1891–1900	82	58	23	1
1901–1905	27	7	19	1
1906–1910	55	6	49	—
1911–1912 (seven months)	13	—	13	—
Total . . .	299	163	133	3

It will be seen that 81 out of the 133 surviving schemes were started since 1900, and 62 since 1905.

The number of workers under existing schemes who were entitled to share in profits at the end of 1911 (or in 1912, in the case of schemes started since 1911) was 57·3 per cent. of the total number of workers in the firms where those schemes were in force. The average "bonus," or share in profits, in 1911 represented an addition to the wages of participants of 5·5 per cent. in the case of those firms who furnished particulars to the Department. This was also the average for the whole period 1901-1911.

There is a great diversity in the schemes as regards the form of bonus to workers. In about three-fifths of the schemes, the bonus is paid in cash. This is especially the case with the older schemes. In a certain number of schemes, the whole of the bonus is paid to a provident fund, or it is partly paid in cash, and the remainder paid to a provident fund. A more common type of scheme, however, is that in which the whole or part of the bonus is retained for investment in the capital of the undertaking; the other part (where all is not so invested) being paid out in cash or retained on deposit with the employers for provident purposes. This capitalizing of the bonus may, perhaps, be regarded as the characteristic feature of the more recent profit-sharing schemes, and is invariably found in the large and important group of gas-works. Many industrial undertakings are, however, not capable of absorbing annual additions to capital; and success is in some cases only attained by keeping the capital account as low as possible.

For one reason or another, a large number of failures seem to have occurred in the various attempts which have been made to give the workers a direct share of profits. In more than half the cases of abandoned schemes, the cause of abandonment seems, however, to be traceable, not to any inherent fault in the scheme as such, but to the falling-off of business, and to the fact that there were no profits to share. This form of weakness is less likely to affect undertakings which are more or less of the nature of monopolies. Gas companies account for 33 out of the 133 profit-sharing schemes now known to be in existence; but it would probably be unsafe to deduce from their experience any general principles applicable to commercial undertakings of an ordinary character.

Doubtless the success or failure of profit-sharing depends largely on the type of scheme introduced, on its applicability to the particular business of the employer, and on the spirit in which it is worked by the two parties to the agreement. To what extent it may be possible for profit-sharing and co-partnership arrangements to become general throughout British industry, and what influence the adoption of such systems would be likely to exert in promoting industrial peace, are questions which are of very great moment, but which it would certainly be improper to attempt to answer in a report like the present, intended, not to formulate opinions, but only to supply the facts and materials upon which a judgment may be formed.

Though an endeavour has been made to render the information contained in this report with regard to profit-sharing and co-partnership in private businesses in the United Kingdom as complete as possible, it is not claimed that the particulars are exhaustive.

Profit-Sharing in Gas-Works.

Out of the total of 106,189 persons employed by all the 133 firms known to the Department to have profit-sharing schemes in operation, no less than 28,246 are in the employment of gas companies. A short account of the scheme in operation in relation to the employees of the South Metropolitan Gas Company, of London, the pioneer of this form of profit-sharing, will be of interest.

South Metropolitan Gas Company.

At the beginning of November, 1889, the South Metropolitan Gas Company, who had already been giving their officers and foremen an annual bonus dependent upon their profits since 1886, adopted a scheme of general participation. In March, 1889, the National Union of Gas Workers and General Labourers of Great Britain and Ireland was formed, and shortly afterwards succeeded in obtaining very considerable concessions in favour of men employed in gas-works. In August-September, 1889, the London dock strike took place; and a general movement was started for securing better terms of employment for the working-classes, and especially for labourers doing heavy work demanding a minimum of technical skill—such as the work required in gas making. In the course of the autumn, the Gas-Workers' Union made certain demands upon the South Metropolitan Gas Company. These were not resisted; but the Company's officials became convinced that further concessions which the Company would feel unable to grant would probably be put forward by the Union, and that "a strike was likely to take place at any moment without any warning." In order to avert this contingency, Mr. (afterwards Sir) George Livesey, the Chairman of the Company, induced the Directors to assent to the adoption of a special system of profit-sharing.

The Company employ a large number of workmen—some all the year round regularly, the others in winter only. The offer made (on Nov. 6, 1889) to all the regular staff in the service of the Company was as follows: The shareholders (as the law then stood) were allowed to received a dividend of 10 per cent. when the price of gas was not above 3s. 6d. per 1000 cubic feet, and an additional dividend of ¼ per cent. for each reduction of 1d. per 1000 feet in the price of gas. The plan proposed was to give the employees a bonus of 1 per cent. on their year's wages for every 1d. reduction below 2s. 8d. per 1000 feet (the price then being 2s. 3d.). In addition, there was to be placed to the credit of every man who should accept the scheme a sum equal to what he would have received as bonus if the scheme had been in force during the preceding three years—this "nest-egg" being equivalent to 9 per cent. on one year's wages.* In order to take the benefits conferred by the profit-sharing scheme, the workman was required to sign an agreement binding himself to work for the Company for twelve months at the current rate of wages; the Company agreeing to employ him during that period, and also undertaking "that no alteration shall be made in the wages to the disadvantage of any of the men." The money coming to the employees under the scheme was not to be withdrawn, except in case of death, during the first year, "nor during the first five years, except in case of death, superannuation, or leaving the service of the Company," but was to remain on deposit at 4 per cent. with the Company, and was to be forfeited in case of a strike or wilful injury to the Company.

Within a week, about 1000 of the regular workmen signed the agreement; but by many of the men much dissatisfaction was felt with the Company's proposals. A very large number of stokers, being employed for the winter only, found that the scheme did not extend to them; and their hostility was, no doubt, a potent factor in promoting widespread discontent with the project. In consequence of a meeting between the Directors and representatives of the workmen who had signed agreements, held on Nov. 21, 1889, the Company withdrew the clause under which a man was to forfeit his bonus in case of strike or wilful injury, agreed to allow the future annual bonuses to be paid out in cash, and made other modifications in order to meet objections. The scheme was issued in a revised form on Nov. 27, 1889; provision now being made for paying a bonus to workmen employed during the winter only (as well as to the regular men), subject to their signing an agreement to serve the Company for three months. However, the Gas-Workers' Union manifested a strong aversion to the scheme on a variety of grounds—the most important objections being that the scheme was likely to induce men to leave the Union, and that men bound by twelve-monthly agreements (especially by agreements terminating at different dates), and punishable for breach of their contracts by penalties of a

* This "nest-egg" offer remained open until Dec. 31, 1889. The original offer stated the amount as equivalent to 8 per cent. on one year's wages. This was altered on Nov. 27, 1889.

criminal* as well as of a civil nature, would find it impossible to strike with effectiveness, if such a measure should appear necessary with a view to obtaining any desired alterations in the conditions of employment. Accordingly, the Union insisted that the profit-sharing scheme should be abolished, *and* [subsequently explained to be a mistake for *or*] that the men who had accepted it should be removed from the works; and to enforce this demand, over 2000 men (practically the whole of the Company's stokers) came out on strike on Dec. 12, 1889. The Company filled the places of the strikers; and the strike, having virtually worn itself out, came to an end on Feb. 4, 1890.

The lines upon which the profit-sharing scheme was carried out were materially changed in 1894, when it was arranged that the rate of bonus should be increased from 1 to 1½ per cent. on wages for every 1d. at which gas was sold below the standard price; provided that, when the rate of bonus reached 9 per cent., the further increase was to be at the old rate of 1 per cent. The new arrangement applied to employees who should agree to have one-half of the whole amount of their bonus for the current year invested for them in the stock of the Company. The bonus was to be calculated on the daily wages, no account being taken of overtime; and as to men on piece-work, on the amount the men would have earned at their ordinary rates in the regular working hours. The sums to be thus set aside out of bonus were to be invested in the names of trustees (three in number—one director, one officer, and one profit-sharing workman); and when a man had so credited to him an amount sufficient to buy £5 worth of stock (the price of which was at that time £12 15s.), a stock certificate should be issued in his name. Such winter men only as arranged to come back the following winter were allowed to have their bonus on the new scale. The Company also undertook to allow 4 per cent. interest upon all withdrawable amounts and any other savings, and to arrange for the investment of any such sums in their stock or shares.

The agreement which the Company required their employees to sign as a condition of their participation in profits† required the employee to state that he was not a member of the Gas-Workers' Union,‡ and the continuance of his employment was made conditional on his not joining that Union.§ But these restrictions were dropped many years ago. The period for which the men engage themselves is, for the most part, twelve months, save in the case of the winter men, whose terms of service vary from three to six months. The rules of the scheme provided for the appointment of a Profit-Sharing Committee (the name of which was, in September, 1903, changed to "Co-Partnership Committee"), and for the election of auditors to supervise the accounts; the terms of these provisions being as follows:

11. A Committee of Management shall be elected, to consist of the Chairman of the Board of Directors, and 17 members elected by the Board, and 18 members elected by the profit-sharers in proportion to the numbers at each station, who shall be elected by ballot; one-third of the members of the Committee to retire by rotation every year, but to be eligible for re-election. Seventeen members shall constitute a quorum, of which not less than eight shall be workmen; and every resolution to be binding at such meeting shall have for its support a majority of the members of the Committee present at, and voting upon, the resolution.

12. The Committee shall appoint a Secretary, who shall have no power of voting.

13. In the event of any difference arising as to the construction of these rules, it shall be referred to the Committee, whose decision shall be final and conclusive.

14. There shall be two Auditors, one to be elected by the workmen, the other to be appointed by the Company, whose duty will be to compare and initial the workman's pass-book with the general account. . . .

15. The Committee shall meet for the transaction of business when summoned by the Secretary, but not less than twice in each year; and on a requisition of 20 employees or three of their own number, at any time.

16. The Secretary shall receive all notices, summon all meetings of the Committee, and obey the orders of Committee in all other matters and things whatsoever.

Other alterations have been made in the scheme since 1894. As from Jan. 1, 1898, the interest allowed on the employees' deposits with the Company was reduced; the reason for this alteration being thus explained in the Company's half-yearly report—

When the scheme was started, the rate of interest paid by the Company on new issues of ordinary and debenture stock averaged nearly 5 per cent.; and that being so, the Directors felt justified in offering 4 per cent. to the employees on their deposits. But now the average rate paid by the Company on new issues is rather under 3½ per cent. Under these circumstances, the Directors felt that it was not in accordance with sound business to pay more on the deposits. The question was explained to the workmen's representatives, who unanimously agreed that it would be right to reduce the rate of interest. To encourage thrift, the Directors proposed that 4 per cent. should be continued on small deposits (£20 was the limit adopted); and on all amounts over that limit the rate of interest was reduced to 3 per cent. from Jan. 1 last. This was readily accepted by the workmen; and excepting a few hundred pounds withdrawn for investment in the Company's stock, the deposits remain as before the reduction of interest.

It was at first found that a considerable proportion of the employees failed to avail themselves of the opportunity afforded them of leaving the withdrawable part of their bonus on deposit with the Company. The Company accordingly gave notice, in August, 1899, that those participants in the bonus who, during the past five years, had regularly withdrawn all their withdrawable bonus, would at the next distribution, in 1900, have nothing placed in their withdrawal account unless they should deposit with the Company, week by week, a sufficient sum to equal by June 30, 1900, a week's wages. It was, however, provided that, if a man should have withdrawn money to invest it otherwise, this notice was not to apply to him. Further, at the end of 1900, it was announced that "all those men who have withdrawn their bonus must deposit not less than 6d. a week in the Company's savings bank, to entitle them to the full bonus next June."

By the Company's Act of Parliament of 1900, the starting-point of the sliding-scale in relation to the dividend of the shareholders was, as from July 1, 1901, lowered from 3s. 6d. per 1000 cubic feet, to 3s. 1d. In the revision of the rules of the profit-sharing scheme which came into force on the same date, the starting-point of the bonus scale was made 3s. 1d., instead of 2s. 8d.; and instead of the two rates previously in force (1 per cent. on wages if all the bonus were withdrawn, and 1½ per cent. if half were invested in stock), the bonus was fixed to be paid in future at one uniform rate—viz., three-quarters of one per cent. on wages for every reduction of 1d. in the price of gas below 3s. 1d. per 1000 feet. At the same time, the investment of one-half of the bonus in the Company's stock was made obligatory for all except the winter men; and the minimum amount of stock to be purchased out of accumulated bonus was raised from £5 to £10. Winter men under agreement were to be entitled to the full bonus, provided they returned the following winter and left the withdrawable half on deposit with the Company; the other half being invested in stock on their behalf. If, however, they chose to take the withdrawable half in cash, they would not be entitled to any investment in stock. Should the half bonus at any time amount to 5 per cent., the maximum payable to winter men taking payment in cash would be reached. With regard to the disposal of their stock by employees, it was now provided that—"Any man selling his stock to any outside party, without the consent of the Secretary of the Company, will at once cease to be a profit-sharer . . . . Those who sell their stock except for the best reasons—such as investing in the building society or buying a house—and those who regularly withdraw their half bonus, will be struck off the list. They may, however, again become qualified by saving for two consecutive years an amount equal to one week's wages in each year." By the same revision, the rate of interest on money of the employees deposited with the Company was made a uniform 3 per cent., irrespective of amount.

By the latest revision of the co-partnership rules, which came into force on July 1, 1910, an important alteration was made in regard to the treatment of the bonus. Up till then, while one-half of the bonus was required to be invested in the Company's stock, the other half might either be left on deposit with the Company or invested in stock, or might be withdrawn at a week's notice. Now it was laid down that this second half of the bonus is to be "left in the Company's hands to accumulate at interest, or it may be invested in stock with the trustees, or it may be withdrawn under special circumstances by giving a week's notice."

Another change made by the 1910 revision was the increase in the number of members of the Co-Partnership Committee from 36 to 54; and it is provided that "candidates must hold, and continue to hold while in office on the Committee, not less than £25 of stock; and they must have been not less than five years in the Company's service.

Speaking generally, a large part of the functions of the Co-Partnership Committee* consists in smoothing away friction which may arise between individual workmen and their employers, and in removing suspicions entertained by a workman that he is not being treated fairly. For this purpose, a very important part is played by the workmen's representatives on this Committee, to whom the workman who thinks himself hardly dealt with applies in the first instance. In very many cases, a talk between the workman and the representative on the Co-Partnership Committee of the class of employees to which he belongs suffices to allay the man's discontent. Should this not be the case, the next step is for the representative before whom he has laid his case to put the matter before the superintendent or other official in charge of the department of the works in which the workman is employed. If the interview between the official and the representative should fail to produce results satisfactory to the complainant, then the case is brought before the Co-Partnership Committee. But the necessity for this step occurs but seldom—most cases being settled in the manner above mentioned. When complaints come before the Committee, its decision is always accepted without demur.

In a certain number of cases, however, the matters which have come before the Co-Partnership Committee have concerned, not individual workmen, but the employees of the Company as a whole. In this manner, the rules of the superannuation fund of the Company have from time to time received necessary revisions. Perhaps the most important of the many useful tasks that have been performed by the Co-Partnership Committee has been the settlement of the rules of the Company's accident fund, and the subsequent revisions of these rules necessary to adapt them to be certified (as they have been) as a contracting-out scheme under the Workmen's Compensation Acts. In relation to this scheme, the Co-Partnership Committee acts as referee in cases of disputed benefits; the entire administration of this accident fund being left in its hands.†

* Persons employed in gas-works, such as those of this Company, who break a contract of service, can, under certain circumstances, be punished by fine or imprisonment under the Conspiracy and Protection of Property Act, 1875 (38 & 39 Vict. c. 86, sec. 4).

† "The Directors reserve the right to refuse permission to sign an agreement to any man who takes no interest in the welfare of the Company, or who is wasteful of the Company's property, or careless or negligent in the performance of his duty."

‡ For the reasons which induced the Company to insert this declaration in the profit-sharing agreement (which originally contained no such declaration) see the evidence given by Sir G. (then Mr.) Livesey before the Labour Commission, "Evidence before Labour Commission, Group C.," Vol. III., p. 244, also p. 238 and p. 598.

§ The Company also had a rule against the employment of members of the Coal Porters' Union. In a circular issued by the Chairman of the Company in September, 1899, it was stated that "the prohibition stands to this day, but no inquisitorial methods are adopted to enforce it."

* The account given in the text is based upon information supplied by the Secretary of the Co-Partnership Committee and by certain of the workmen's representatives on the Committee.

† In connection with this accident fund, a system of "Juries of workmen" is in force. The rules of the fund provide that an inquiry shall be made into every accident that is a charge on the fund, and may, at the discretion of the Company's Engineer, be made into any other accident. "Every jury shall consist of not more than two members of the Co-Partnership Committee of the station, not more than four from the department in which the accident happened, and the remainder [making the number up to twelve] in order from the jury list." The duties of a jury include that of investigating the circumstances causing the accident, and stating "whether any blame attaches to any official or workman, or whether the plant, machinery, or means of protection were defective, if they are satisfied there has been any neglect or carelessness or defect," and "if, in the opinion of the jury, anything can be done to prevent a similar accident in future, they shall make such recommendation as they may consider necessary."

On Aug. 27, 1898, a scheme for the election by the officers and workmen of the Company of employee-directors, made under the provisions of the Company's Acts of 1896 and 1897, came into operation. This scheme was to continue in force for three years (subject to cesser, if the amount of the investment of the employees in the stock of the Company should fall below the nominal amount of £40,000), and was renewed in 1901. In 1907, the scheme was again renewed for a further period of 43 years. It is, however, subject to prior determination, should the employee-shareholders reduce their holding of stock below certain specified limits, or should the shareholders resolve that the co-partnership scheme no longer answers its purpose of promoting a true union of employers and employed. Such resolution is to be subject to the approval of the Board of Trade.

The number of employee-directors is not to exceed three, of whom one shall be a salaried officer, and the other two employees in receipt of weekly wages; and it may be reduced below that number if the amount of stock held by the employees should decrease. At the date of the adoption of the 1907 scheme, the employees held stock of the Company to the aggregate amount of approximately £200,000, or one-thirty-second of the total capital of the Company; and the scheme provides that—

> If at any time the aggregate investment of the employees should fall back by 10 per cent. of its amount below any figure it may have attained less than one-tenth part of the paid-up capital, the number of employee-directors shall be reduced to two by lot, provided the reduction of the aggregate holding of stock is general with the salaried staff and the weekly wage-earners. If it is entirely or mainly in either section, justice requires that section to lose a Director. If the reduction should amount to 20 per cent., the number of employee-directors shall be reduced to one by lot. Provided that if the aggregate investment should be restored to the original maximum the directors lost by the first and second reductions shall be restored. A reduction of 30 per cent. shall disqualify the remaining employee-director.* So long as the aggregate holding exceeds one-tenth part of the ordinary nominal capital, the above provisions as to reductions shall not apply.

With respect to the qualification of an employees' director, it is provided that—

> The qualification of an employees' director shall be two-fold—the having been continuously not less than fourteen years in, and continuing in, the employ of the Company, and the having held for not less than twelve months prior to the date of election, and the continuing to hold, not less than £120 stock of the Company, accumulated under the co-partnership scheme. As the aggregate holding of stock increases, so shall the qualification . . . of employee-directors increase in the following proportion:
>
> | | | | |
> |---|---|---|---|
> | Aggregate holding | £200,000, | qualification | £120 |
> | ,, | £300,000, | ,, | £140 |
> | ,, | £400,000, | ,, | £160 |
> | ,, | £500,000, | ,, | £180 |
> | One-tenth of capital or more, | | ,, | £200 |

Taking the whole period during which the profit-sharing scheme has been in force, the bonuses paid under the scheme have made an addition to the wages and salaries of the participants at the average rate of 6·9 per cent. The number of persons employed by the Company in 1911 varied between 5534 and 6704, of whom, at the end of 1911, 5800 were entitled to share in profits. In all, 5656 of the Company's employees hold between them ordinary stock of the Company to the (nominal) amount of £301,490 (of whom 4767 hold in their own names £290,700, the trustees holding £10,790 on behalf of 889 employees).† In addition, the Company hold on behalf of 5534 of the employees deposits (accumulated bonus and other savings) to the amount of £54,260.

With regard to the share in the control of the affairs of the Company possessed by the employees, it is estimated that, out of the total number of votes which could be given at a general meeting of the shareholders, the proportion representing the voting strength of the employee-shareholders is about 2 per cent.; while of the ten Directors of the Company, three (one official and two workmen) are representatives elected by the employees.

In reply to the questions addressed to them by the Department as to the results of the system above described (asking whether the system had proved satisfactory, whether it had called forth extra zeal, and whether it had tended to promote harmonious relations between employers and employed and avoidance of strikes and disputes), the Company state: "To all the above questions—Yes."

One of the appendices to the report gives further details of the co-partnership scheme of the South Metropolitan Company, and sets forth the rules, and the form of agreement between the Company and the employees. From this appendix, the following table has been taken.

Summary Showing the Rate and Amount of Bonus Earned Yearly.

Year.	Rate Per Cent.	Total.
1889	(Nest-Egg)	£6,863
1890	5	6,037
1891	5	10,010
1892	3	6,145
1893	4	7,872
1894	6	11,785
1895	6	12,892
1896	7¼	16,906
1897	7¼	18,000
1898	7¼	18,207
1899	8¼	21,374
1900	9	24,592
1901	3¾	10,401
1902	7½	25,676
1903	7½	28,151
1904	8¼	33,696
1905	9¾	42,648
1906	9¾	43,962
1907	9¾	45,591
1908	7½	36,416
1909	7½	37,123
1910	8¼	41,327

(NOTE.—The bonus year ends on June 30)

* If the conditions laid down as to the aggregate holding of stock by employees are at any time restored, then the Directors, with the shareholders' consent, may revive the scheme.

† It should be understood that some of the 4767 employees holding stock in their own names also have fractions of £10 held for them by the trustees.

OTHER GAS COMPANIES.

The example set by the South Metropolitan Gas Company in 1889 was followed in 1894 by the Crystal Palace District Gas Company (known since 1904 as the South Suburban Gas Company), who adopted a system generally similar to that of the pioneer Company. Seven years later, in 1901, a similar scheme was introduced by the Chester United Gas Company and the Commercial Gas Company. Until the year 1908, these four gas companies were the only ones that had profit-sharing arrangements in force. But in 1908 twelve such companies, in 1909 nine (including the Gaslight and Coke Company, of London, employing 10,000 to 11,500 persons), in 1910 two, and in 1911 three gas companies adopted profit-sharing schemes. And up to the end of June, 1912, their example had been followed by three other gas companies.

It is of interest to note that these 33 profit-sharing gas companies manufactured between them in 1910 49 per cent. of the total gas produced by all the gas companies of the United Kingdom. The systems of profit-sharing which are in operation in these undertakings are upon lines generally similar to the bonus and investment scheme of the South Metropolitan Gas Company, just described, but exhibit certain variations from that scheme, the more salient of which will now be indicated.

Conditions Attached to Participation.—Participation in profits is almost invariably made conditional on the signing of an agreement of service, usually for twelve months, but for shorter periods in the case of special classes of employees, particularly the men employed only in winter. Such a restriction is not, however, imposed, in practice, by the Rugby Gas Company, and is not provided for by the rules of the Watford Gas and Coke Company, the Epsom and Ewell Gas Company, the Plymouth and Stonehouse Gaslight and Coke Company, or the Aldershot Gas, Water, and District Lighting Company. The Chester United, Wrexham, and Dartford Gas Companies require that their employees, in order to be allowed to sign agreements, shall be members of benefit societies. The Gloucester Gaslight Company exclude from participation employees whose salaries exceed £200 per annum.

Determination of Amount of Bonus.—In nearly all cases the rate of the bonus, as with the South Metropolitan Gas Company, varies inversely with the price of gas, and is not contingent upon any other factor. But in two cases (the Epsom and Ewell Gas Company and the Watford Gas and Coke Company) the bonus takes the form of an addition to wages varying also with the amount of deposits with the Company made by the employee.

The scheme of the Epsom and Ewell Gas Company provides that each profit-sharing employee shall pay to a fund created under the scheme 1s. or 6d. a week, to which the Company add an amount varying with the price of gas. Thus, if the price of gas is 3s. 7d. per 1000 cubic feet, the bonus addition is at the rate of 1s. or 6d. a week (*i.e.*, an amount equal to the employee's own payment); if the price falls to 3s. 6d., then the bonus addition rises to 1s. 0¾d. in the case of a man contributing to the fund 1s. a week, or half that sum in the case of a man contributing 6d.; and so on up to a maximum of 1s. 6d. (or 9d., as the case may be), when the price of gas falls to 2s. 11d. A scheme on generally similar lines is in force with the Watford Gas and Coke Company.

Investment of Bonus.—While the rules of a large number of gas companies* provide, like those of the South Metropolitan Company, that one-half of each bonus shall always be invested in the Company's stock, under the schemes in force with the Tunbridge Wells Gas Company, the Wrexham Gas Company, and the Merthyr Tydfil Gas Company, the employees are required to leave the whole of their first five annual bonuses to be invested in the Company's stock. The Dartford Gas Company require the first two bonuses to be thus invested. The employees of a large number of gas companies† have to leave for investment the whole of their bonus until the employee holds a specified amount of stock or shares. Under the schemes in force with the Walker and Wallsend Union Gas Company, the Watford Gas and Coke Company, the Wandsworth and Putney Gaslight and Coke Company, the Epsom and Ewell Gas Company, and the Harrow and Stanmore Gas Company, the whole of the bonus is always to be invested in stock or shares of the Company.

Provisions as to Withdrawable Bonus.—So far as concerns the part (if any) of the bonus which is not required to be invested in stock or shares of the Company, this money, usually one-half, is either (*a*) paid out in cash, as in the cases of the Rugby Gas Company, the Wellingborough Gas Company, and the Dartford Gas Company, or (*b*) is deposited with the Company. In the latter case it is withdrawable, in many cases‡ at short notice; but in some cases§ (as with the South Metropolitan Gas Company), only under special circumstances or for special purposes.

* South Suburban Gas Company, Chester United Gas Company, Commercial Gas Company, Leamington Priors Gas Company, Tottenham and Edmonton Gaslight and Coke Company, Gloucester Gaslight Company, Grantham Gas Company, Longwood Gas Company, Liverpool United Gaslight Company, and the City of Waterford Gas Company.

† Cambridge University and Town Gaslight Company (£20); Bournemouth Gas and Water Company, Rugby Gas Company, Cardiff Gaslight and Coke Company, and Hertford Gaslight Company (£10); Croydon Gas Company, Gaslight and Coke Company, Wellingborough Gaslight Company, Ilford Gas Company, Weston-super-Mare Gaslight Company, Aldershot Gas, Water, and District Lighting Company, Plymouth and Stonehouse Gaslight and Coke Company, and Enfield Gas Company (£5).

‡ South Suburban Gas Company, Chester United Gas Company, Bournemouth Gas and Water Company, Tunbridge Wells Gas Company, Rugby Gas Company, Gaslight and Coke Company, Wrexham Gas Company, Grantham Gas Company, Wellingborough Gaslight Company, Dartford Gas Company, Longwood Gas Company, Liverpool United Gaslight Company, Merthyr Tydfil Gas Company, Hertford Gaslight Company; Leamington Priors Gas Company, Gloucester Gaslight Company, Cambridge University and Town Gaslight Company, City of Waterford Gas Company, Tottenham and Edmonton Gaslight and Coke Company, Croydon Gas Company, Weston-super-Mare Gaslight Company, Plymouth and Stonehouse Gaslight and Coke Company, Enfield Gas Company. In the last nine cases withdrawal is discouraged by the statement that regular withdrawal will debar an employee from future participation, or may lead to the abandonment of the scheme.

§ Commercial Gas Company, Cardiff Gaslight and Coke Company, Ilford Gas Company, Wandsworth and Putney Gaslight and Coke Company, Aldershot Gas, Water, and District Lighting Company.

The interest which has been acquired in the capital of these profit-sharing gas companies by their employees amounts in the aggregate to a very considerable sum; for they own stock or shares (ordinary) to the total nominal value of £459,581, while the market value at present prices is considerably in excess of that amount. They also own preference stock to the total nominal value of £110, and debenture stock to the total nominal amount of £627; while they have on deposit with their respective employers sums amounting in the aggregate to £142,134.

With respect to the share possessed by these employees in the control of the affairs of the companies by which they are employed, it must be remembered that in most cases sufficient time has not elapsed to enable them to acquire enough stock or shares to entitle them to more than a quite insignificant voting strength. The proportion of the total number of possible votes at a general meeting of the Company which could be given by their workpeople is estimated at more than 1 per cent. in six cases only (Leamington Priors Gas Company, 1·7 per cent.; South Metropolitan Gas Company and Cardiff Gaslight and Coke Company, 2 per cent.; Chester United Gas Company, 2·8 per cent.; South Suburban Gas Company, 2·9 per cent.; Grantham Gas Company, 5 per cent.).

In two cases only are the employees of the companies represented on the Board of Directors—the South Metropolitan Gas Company (as mentioned above) having three employee-directors, and the South Suburban Gas Company two. But in every case there exists, in connection with the profit-sharing scheme, a joint committee of employers and employed, with functions generally similar to those of the Co-Partnership Committee of the South Metropolitan Gas Company.

Opinions of Employers.

One section of the report consists of quotations from opinions of employers as to the results obtained by profit-sharing and co-partnership; and as to these, it is remarked that in the great majority of instances the satisfaction of employers with the effect produced by the adoption of profit-sharing and co-partnership is entirely unqualified, while in some cases they express a very high degree of appreciation.

CONTINENTAL UNION GAS COMPANY, LIMITED.

Setting the House in Order—A New Lease of Life.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Colonel H. Le Roy-Lewis, C.B., D.S.O., in the chair.

The Secretary (Mr. W. Martin) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

A Reconstructed Board.

The Chairman said before he formally moved the adoption of the report and accounts, he would briefly review the affairs of the past year, in order to give to the stockholders an account of the stewardship of the Board. In doing so, he hoped it would be remembered that the *personnel* of the Board had been changed a good deal during the twelve months; and also that he personally had only been responsible as the Chairman over two months for the report which was now put before the meeting. He would like to allude very briefly to the personal changes that had taken place during the last twelve months. The most important one that had occurred was in the chairmanship of the Board. It always seemed to him—and he thought it was a general and universal practice—that, when a great officer of State resigned his appointment, the electors of the country were entitled to know the reasons that had actuated him in taking the step. Also in the same way in the case of a joint-stock company, it seemed to him that it was only right and proper, when a Chairman retired from his office, for an explanation to be made accounting for the reasons that had induced him to do so. He might say, first of all, it was to the great and universal regret of all the members of the Board that his friend, Mr. Birchenough, had found it necessary to retire from the chairmanship. He had done so, and he (the Chairman) thought he had his authority for saying it, not on any account because of differences of opinion in regard to the policy the Board had pursued, but simply and solely because he found his other avocations pressed so much on him that he had been unable to give the amount of time to the interests of the Company which he felt it was entitled to receive. Mr. Birchenough had this year to leave the country and spend seven months in South Africa, He felt, therefore, that before going it was necessary and incumbent to make a change in the chairmanship of the Board. They welcomed him back that day in their midst; and they were glad to see him considerably benefited in health and spirits from his trip to South Africa. They had also during the year had to regret the resignation of Mr. Gardiner, who had been for thirteen years a Director of the Company, as well as their old friend Mr. Garey, who, he believed, was a Director for more than thirty years. The retirement of Mr. Garey, he really thought, called for something more than a passing word. Mr. Garey had been associated with the Company ever since its inception, and had been connected with other companies in which their own had a considerable interest, ever since the year 1847. This was a very long period. Mr. Garey, he (the Chairman) believed, entered the service of the Company, in which they were so largely interested, as an Engineer. He then became the Manager of a station, and was subsequently one of the travelling accountants. He also filled the post of Secretary of the Company; and finally he gained a seat on the Board of Directors, which he occupied for more than thirty years. Now at a very ripe age, which he (the Chairman) thought it would be indiscreet of him to reveal, Mr. Garey had considered it wise to retire from participation in the active management of the affairs of the Company; and he (the Chairman) felt certain the stockholders would wish him all health and prosperity in the retirement which he had now considered it desirable to enter upon. The Board had, in order to replace the two gentlemen who had recently resigned, elected—and they would ask the stockholders to confirm the election—two gentlemen, Mr. G. A. Touche, M.P., and Mr. E. A. Goulding, M.P. Mr. Touche in the City of London needed no words of commendation. He was so well known in the City, and so well known as a Director of successful and prosperous enterprises, that, to his (the Chairman's) mind, the securing of him to take a seat at the Board was, at any rate, an earnest of careful and prudent management, and he thought also of successful management. Mr. Touche was very well known in public life; and on that side of his career, he would not descant to a great length. But he thought it was of considerable importance to have a gentleman honourably and highly connected in public life on the board of a company. It did a company like their own no harm, while it might be a source of considerable strength to them. They had been lucky enough also to secure Mr. Goulding for a seat at the Board. Mr. Goulding, he need hardly remind the stockholders, had been one of the most active, and one of the most intelligent, critics on the other side of the table. The poacher was now gamekeeper [laughter]; and he (the Chairman) felt certain, in his new capacity as gamekeeper, with the considerable aptitude and interest he had displayed in the Company's affairs, that he would be of invaluable assistance to the Board. Mr. Goulding was also well known in public affairs; and the remarks he (the Chairman) had made concerning Mr. Touche applied equally to him.

The Messina Difficulty Settled.

Having alluded to the personal element, which had figured so largely in the twelve months, he would call attention to what, after all, was the most important item in the report. That was the Messina settlement. He was glad to be able to say that day that it was a settlement; and that the matter was no longer in the state of flux in which it had been unfortunately for three or four years. Before he alluded to the settlement, he should like to give briefly a *résumé* of the history of the Messina business. He really thought that no company was ever so overwhelmed by an unmerited disaster as had been this Company in the Messina affair. At the beginning of December, 1908, they owned the Messina station. It stood in their books at that time, as it still stood unfortunately in the present balance-sheet, at £82,000 odd; and it yielded a comfortable little income of £8000 to £10,000 a year. Therefore, he did not think the Directors who were responsible for the management of the Company's affairs at that date were at all unjustified in the amount at which they valued the Messina station. It paid the Company 10 per cent.; and he thought it was very fairly valued at about £82,000. Besides this, there was another asset which had figured in their balance-sheet, and which he hoped figured in this one for the last time. That was the item of £36,000 for the town debt of Messina. This debt was incurred by the Municipality of Messina for public lighting and other services rendered by the Company. The stockholders might naturally ask, "Well, if this was the case, why was not the debt liquidated?" The matter was not so simple as that. The town of Messina had a counter-claim against the Company. One of the clauses of the contract provided that, if improvements took place in the manufacture of gas, the town should share rateably with the Company in the benefits of the improvements. The town made a claim founded on this clause against the Company amounting to £8000 or £10,000; and it was for this reason the debt was not liquidated. At any rate, the nice sum of money which figured on the asset side of the balance-sheet at from £110,000 to £120,000 was in existence at the beginning of December, 1908. At the end of that month, the whole town of Messina, the Company's station and assets, had been blotted out by an earthquake. He was bound to say that no company of this description of which he had heard had ever been placed in a similar position. The point came, of course, as to what steps should be taken to recover from the *débris* of the town of Messina a substantial amount in order to help to make up the inevitable hole that must arise on the assets side of the balance-sheet. It was towards trying to settle this that the efforts of the Board had been directed almost entirely during the last four years. The negotiations had been difficult, lengthy, and continuous. They had constantly been at the point of succeeding, and had even genuinely thought that they had succeeded; but never until quite a short time ago had the negotiations been absolutely and completely settled. The Board pressed the Italian Government in season and out of season for the payment, at any rate, of a certain amount of the debt which they acknowledged they owed the Company; but they had been quite unable to get them to part with any money, or even to acknowledge the justice of their claim. Negotiations had been long, and had been entered into by the bushel and the gross; but the moment the delicate question of payment was alluded to, the other side immediately began to talk of something else. He should like here to thank their colleague Mr. A. F. Phillips for the part he had taken in this matter. He (the Chairman) did not know how many times Mr. Phillips had been to Italy over the Messina business, and had penetrated as far as Messina. Without his help and guidance, he (the Chairman) doubted whether the present settlement would ever have been arrived at. However, the settlement had been come to; and it was reached at the end of last May. At that time, he and Mr. Phillips went to Rome, and had an interview with the Minister of the Interior. It was only then that a final settlement was come to. To show how tricky the whole thing had been, and how difficult it had been to reach finality in the matter, he might say that it was not until October this year that a final contract approving of the settlement was signed, sealed, and ratified. The stockholders might, of course, be anxious to know whether they had absolutely fingered the cash for these thousands of pounds; and he could tell them that only that day they had received a telegram from the Company's official who was in charge of this business in Italy, informing them that the Italian Treasurer had issued his *mandat de payement*, and that without doubt the cheque for the amount would be received during the course of the week. Bearing upon this, an error had crept into the Directors' report, through the transposition of a figure. It was stated that the amount agreed upon in settlement of the debt was 593,000 lire, or about £27,300. The atter figure was, of course, wrong; it should be £23,700.

The Accounts.

Passing from the consideration of the Messina business, which he hoped he had made plain to all the stockholders, he should like to say a few words with reference to the balance-sheet. They had at the top

of the left-hand side of the general revenue account an item to which exception was sometimes taken at meetings of stockholders: "Management and general charges." The £2712 represented not only the Directors' fees, which amounted to, roughly speaking, about £200 a year, but they represented the salary of the Secretary—the salary of an old and valued servant of the Company—the rent of the London offices, auditors' fees, and the general office expenses. He did not think himself they could ever hope to get these expenses very much lower; but he still had certain plans and ideas by which he hoped to save a few hundreds. This, however, was a sum that was relatively unimportant. But he mentioned it, because he knew that, at stockholders' meetings, there was a certain school of thought that imagined the salvation of a company rested in docking the Directors of some £50 a year of their emoluments. He confessed himself that, being a Director, he had little or no sympathy with that school of thought. [Laughter.] In the item "Pensions, London and Messina," the stockholders would mark the evil influence which continued, and would continue, to dog their footsteps as far as Messina was concerned. Of the £1398, no less an amount than £1100 was chargeable to Messina pensions. When misfortune overtook their employees at Messina, he thought the Board dealt liberally with them, and he hoped the stockholders did not think too liberally. But this pension charge must remain for a great many years yet to come. On the credit side of the general revenue account, little or no change had taken place. Comparing the figures with those for the previous year, it would be seen they had received slightly less as dividend in the Union des Gaz. This circumstance was fully accounted for by the fact that they sold 353 shares in the Union des Gaz; and therefore they naturally received less revenue. As to the appropriation of net revenue, the account stood practically the same as in the preceding year. There was little or no difference in the items. Respecting the right-hand side of the balance-sheet, there were one or two matters he should like to mention. The Messina outlay he had already referred to, as well as the Messina town arrears. The Messina amortization now amounted to the very sufficient sum of £52,000; but he thought that a word was called for from him with reference to the investment of the reserve fund account. The sum of £40,423 was invested in such first-class securities as Consols, local loans, &c.

A Shareholder: How many Consols have you?

The Chairman: £5379. Proceeding, he said on the total amount a severe depreciation on the cost price had been experienced, representing £3515. This was the common experience of all people who had trusted to the credit of the British Government. But he was glad to tell the stockholders that this was more than amply made up by the valuation of the Company's other assets, so that their million of capital stood absolutely intact at the present date. On the £102,955 represented by sundry investments in various gas companies, the total depreciation to date figured out very much better than the depreciation of Government securities. On the gas securities there was a depreciation of only £94; so that really he wished the whole of the reserve fund had been invested in this class of security. If the valuation had been made after June 30, the figure would have been even better than the one he reported to them now.

A FORECAST.

He would, in conclusion, like to say a few words by way of forecast. It seemed to him (of course, he made this forecast very tentatively, because it was impossible to tell them definitely what might happen during the next seven months of the financial year) that, when the accounts of the Company were closed next year, the first duty of the Directors would be to close the Messina account, and wipe out from the balance-sheet the horrible old incubus that had hung round their necks for the past four years. They had sufficient money to do this. Owing to the wisdom of his predecessors, and especially of Mr. Lucas, they had been able to build up a small reserve fund of £40,000. They had £52,000 already in the Messina amortization account, making altogether the ample sum of £92,000. If they took £20,000 (he put it at a low figure) off the money they were receiving from the Government of Italy in settlement of their claims, they would have practically enough money to wipe off the whole of the Messina capital charges. Then they would start on a new lease of life. He could see no particular reason, being intimately acquainted with all the affairs of the Company, why the future should not be—he did not say considerably brighter, but brighter than it had been in the past. That they would ever return to the old era of 13 per cent. dividends, he thought they might immediately dismiss from their minds—at any rate, they never would do so for many years to come. But they might reasonably look to things going on as they were in the companies in which they were interested. He saw no particular reason to the contrary; for he did not see why anything specially bad, or any influence detrimental to the welfare of the Company, should arise. He even saw no reason why a small increase in the rate of dividend might not be expected by the stockholders. At the same time, he ought to warn them of the fact that gas undertakings this year were going through a peculiarly trying time; and, of course, it was in gas undertakings that the vast majority of their capital was invested. They had to fight against two very adverse influences. The one was the high price of coal; and the other, no less serious for them, the high price of freights. Over neither of these circumstances had the Board any power whatever. They could only do their best; and they could only hope that, at the end of the year, gas companies might, by the increase in the value of their residuals, actually not make any such disastrous loss as some people might think they would do. But he saw no reason why, having got rid of their Messina trouble, the future of the Company should not be considerably better than had been the past. If any stockholder should be under the illusion that it would be a good thing to wind up the Company, he should like immediately to disabuse his mind of any such idea. Still, if anyone had any practical scheme for doing this without loss to the stockholders, he (the Chairman) sincerely trusted he would not keep the scheme locked up in his breast, but would communicate it to the Board. So far as the Board were concerned, they saw no prospect of having any such opportunity offered to them. The Company's future lay in the wise and careful administration of their assets, in nursing the Companies with which they were intimately allied, and in devoting constant and unremitting attention to the affairs of the stockholders. He formally moved the adoption of the report and accounts.

The Deputy-Chairman (Mr. Arthur Lucas) seconded the motion.

Mr. J. F. Remnant, M.P., said he should like, from the stockholders' side of the table, to congratulate the Chairman upon his selection for the chairmanship of this important Company; and if they were to judge the way in which the affairs of the Board were managed by what had transpired that day, all he could say was they were particularly happy and lucky to have Colonel Le Roy-Lewis in the chair. The Chairman had alluded to the Directors who had gone. It would perhaps be out of place for him (Mr. Remnant) to comment upon them. They were all sorry to lose old friends; and they were prepared to give them the fullest credit for all they had done. But it was a happy augury on the first appearance of their present Chairman for him to be able to announce that the too-long settlement of the Messina affair had at last been accomplished. The stockholders congratulated the Board upon it. The two new Directors would be a great addition to the strength of the Board, and would be sufficient to create confidence on the part of the stockholders.

Mr. C. I. Thornton said the Chairman had referred to the sale of between 300 and 400 Union des Gaz shares. Some twenty years ago the shares were at a high price; he believed something like 1200 frs. per share. Would it be any breach of confidence to tell the stockholders at what price the shares referred to were sold?

Mr. H. C. Davenport remarked that one thing that struck him was the enormous tax they had to pay on the dividends. It practically amounted to 10 per cent. on their dividend—£5600 odd on £58,000. This seemed to be a lot to have to pay. Was there no way of avoiding this, by, for instance, having the money sent direct to the stockholders from Paris? As it was, they had to pay two taxes.

Mr. C. S. Williams remarked that there had been a French report issued with regard to the municipalization of gas companies. He should like to hear the Chairman's opinion as to how this would affect the Company or the Union des Gaz.

Mr. Cave Orme endorsed the congratulatory remarks of Mr. Remnant. It had been his own intention to make a congratulatory speech upon the labours of the Board, and not, on this occasion, a critical one, as he had done several times in the past. Those speeches had been made with the best interests of the Company at heart. Inasmuch as he held £4400 of shares, naturally he had deep and sincere interest in the Company.

Mr. R. Stevens asked the reason for the continued sale of the Union des Gaz shares. He saw no reason now for six Directors and a staff to deal with the dividend of the Union des Gaz; and he moved a resolution that the Directors be requested to consider the desirability of winding up the Company, and reporting to the stockholders.

There was no seconder of this.

Mr. C. P. Crookenden suggested to the Board that in future the dividend should be paid less tax—now the universal custom.

Mr. Cave Orme said there was one thing the Chairman had omitted in his speech. He had spoken of the great care and attention others had given to the Messina business in Italy; but he had entirely omitted to say anything as to the great personal care and attention that he had given to the matter.

Mr. Walter Hunter congratulated the Chairman and Directors on the present condition of the Company's affairs, which was very satisfactory to the stockholders. He asked whether the Chairman could give them any information as to the state of the Company's relations with their workpeople in Italy; also whether any steps had been taken to introduce prepayment meters.

The Chairman, in reply, first thanked Mr. Remnant and the other stockholders for the kindly and courteous way in which they had referred to him personally. As to the price obtained for the Union des Gaz shares that had been sold, the figure was £29 per £20 ordinary share. The question of double income-tax was a serious one. The two represented nearly 10 per cent. of their income. How to avoid it, passed the wit of man. He must remind those gentlemen who thought that a way of escape from double income-tax could be found by winding-up the Company, and distributing the assets by means of shares in the Union des Gaz, that this would not be a relief from their sufferings, because, as individual stockholders, they would pay tax in France on the profits the Company enjoyed, and, when the money was brought over to England, they would find it taxed again by the British Government. Although the amount would not figure in the balance-sheet, the result would be exactly the same. There was one answer only to the proposal as to winding-up the Company. If any coherent plan were handed to the Board, they would be willing to consider it. But with the fullest information they possessed at the moment, they considered it would be detrimental to the interests of the Company even to attempt any such negotiation. It would have a terrible effect on the price of the shares of the Company in which they were so largely interested. With Mr. Crookenden's suggestion that the dividends should be paid less income-tax, the Board were in entire sympathy. Next year the Board would pay the dividend net; and make up in increased dividend whatever loss the stockholders had to suffer by the deduction of income-tax. The relations of the workpeople in Italy with the Union des Gaz, which relations were so bad for several years, were now, he was happy to say, most excellent. With reference to prepayment meters, they used them by the tens of thousands at the stations of the Union des Gaz. As to municipalization, the steps that had to be taken were so long and laborious, and were surrounded by so many difficulties, that, so far as one could see, there was not likely to be any interference with the working of the large stations of the Union des Gaz. That, however, might not be the case the day after to-morrow; and he could only speak vaguely upon it. But if any further information was required, he suggested that an inquiry should be addressed by anyone interested to the office of the Union des Gaz in Paris.

The motion was unanimously carried.

On the proposition of the Chairman, seconded by Mr. G. A. Touche, M.P., dividends of 4 per cent. on the ordinary stock (free of income-tax) and 7 per cent. on the preference shares (less tax) were

declared, deducting the interim dividends already paid of 2 and 3½ per cent. respectively.

Moved by the CHAIRMAN, seconded by Mr. E. A. GOULDING, M.P., Mr. Birchenough was re-elected as a Director. Two further resolutions were moved by the CHAIRMAN, and seconded respectively by Mr. A. F. PHILLIPS and Mr. BIRCHENOUGH, which returned Mr. Touche and Mr. Goulding to their seats at the Board.

Proposed by Mr. H. C. DAVENPORT, and seconded by Mr. H. J. LUFF, the Auditors (Messrs. A. T. Eastman and E. P. Crookenden) were re-appointed.

Moved by Mr. CAVE ORME, and seconded by Mr. REMNANT, the Chairman and Directors of the Company were heartily thanked for their services.

Acknowledgment was also made of the services of the Secretary and staff; and the proceedings then terminated.

SPIRAL-GUIDED HOLDER FOR BOLTON.

Gas Committee's Policy Criticized.

The proposal of the Bolton Gas Committee to construct a four-lift spiral-guided holder at the Lum Street Gas-Works, at an estimated cost of £20,000, was only confirmed by an odd vote at last Wednesday's meeting of the Town Council. The opposition was directed not so much to the necessity for the holder as to the suitability of the site and the policy of the Gas Committee in not advertising for tenders.

Early in the discussion, Mr. J. Taylor, who spoke from 24 years' experience of gas-works, pointed out that the new holder would be in close proximity to an acid tank. He would not, he declared, spend twenty pence upon a holder in such a position. Mr. J. H. Crook, in reply, said the site was the only available one at these works, and precautions would be taken as to the point raised by Mr. Taylor. On the same matter, Alderman Miles expressed the opinion that it would be unwise to place a holder in a congested place. The new holder would rise in the air half as high again as the present one, and thus be an eyesore in the neighbourhood. Then there was the close contiguity of the sulphate tank; and he thought the Gas Committee would be wise in taking the matter back for further consideration.

Alderman Webster, the Chairman of the Gas Committee, refused to accept an amendment referring the minute back. In reply to Alderman Horridge, he said they did not advertise for tenders; they sent out inquiries to different firms. Alderman Horridge: "Why was one of the most eminent firms in this class of work left out?" Alderman Webster: "The Engineer was asked to send out to the very best firms." Alderman Miles urged that an additional reason for the amendment being accepted by the Gas Committee was the fact that this costly work had not been advertised. He learned that a number of firms had been requested to tender, and without mentioning names he noticed that a celebrated firm had not been asked.

In the subsequent discussion, the absolute necessity of the work being proceeded with at once was urged by Alderman Webster and other members of the Gas Committee. Mr. T. Y. Kitson said if the matter did not go through that day it was very probable they would not be able to have a holder up by next winter; and Mr. R. Tootill observed that they had been given to understand that the work could not be guaranteed for completion next winter unless it was taken in hand at once. Alderman Webster, in his reply, said the present holder was in a very bad state, and the Engineer had intimated that he would not take the responsibility of it. A month's delay would make all the difference in the world, and mean the loss of the use of the holder for another year. Replying to a question, Alderman Webster said the estimate was £20,448 for the spiral-guided holder; while one of the old type would have cost £30,000.

When the matter was put, there voted for the amendment 33, and against 34. Therefore, as stated, the Committee's proposal was only carried by one.

Walton-le-Dale Water Supply.—The Walton-le-Dale Urban District Council having applied to the Local Government Board for sanction to borrow £4500 for works of water supply, an inquiry was held at the offices of the Council last Tuesday by Mr. M. K. North, M.Inst.C.E. It was explained that the township, with an estimated population of 12,500, derives its present water supply from three sources—a well at Brindle, a supply from Thirlmere per the Manchester Corporation, and a local borehole. The cost of the supply from Thirlmere, up to 200,000 gallons per day, is 7½d. per 1000 gallons. With the borrowed money, the Council propose to duplicate the existing plant at the borehole, because it is believed that there is an ample supply of water there. The Council, through their Clerk (Mr. W. S. Woodcock), asked the Inspector that the period of repayment for the loan might be thirty for buildings, and fifteen years for machinery. There was no opposition to the application.

Queensland Water Supply.—In the report of the Hydraulic Engineer of Queensland, which has lately been issued, it is stated that the total aggregate number of artesian bores in the State in 1911 was 785, of which 35 were sunk by the Government, 19 by local governing bodies, and 731 by private owners. The total aggregate depth sunk was 1,762,500 feet; the total number of artesian, sub-artesian, or pumped supplies, was 329; and the number of those in progress, abandoned, or uncertain, was 1711. The number more than 3000 feet in depth was 113; and the greatest depth sunk in one bore was 5045 feet, or only 235 feet short of a mile. The greatest outflow per day is given by the two bores sunk by the Barcaldine Shire Council—7,453,000 and 7,240,000 gallons respectively. There are also in Queensland more than a hundred perennial springs known to the department, one of which, the Ban Ban spring, near Gayndah, gives a daily outflow of 2,000,000 gallons; while several others give 100,000 gallons daily.

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COKE AND GAS MANUFACTURE IN BELGIUM.

We learn from an article in the Engineering Supplement to "The Times" that a Company has recently been formed with the object of erecting a large coke-oven plant to supply from 3 to 6 million cubic metres (106 to 212 million cubic feet) of gas obtained as a bye-product to the existing municipal gas-works of Ghent. The gas will be conveyed in a pipe from the ovens, which will be on the Semet-Solvay system, and will be erected on a site of nearly 196,000 square yards, with a frontage of about 2000 feet along the dock No. 3 in the new maritime installations. In the first instance, the Company will start the works required to supply, from Jan. 1, 1914, the smaller quantity mentioned above at the fixed rate of 2c. per cubic metre (5½d. per 1000 cubic feet); and as the contract includes the concession for the supply of electricity in the form of three-phase current at 6000 volts at the fixed rate of 3·5c. per kilowatt-hour for a guaranteed yearly consumption varying from 3 to 6 millions, the erection of a central power-house, utilizing a portion of the gas supplied by the coke-ovens, has also been decided upon. The concessions for the supply of gas and electricity expire in 1939; but they may be extended to 1949.

The Compagnie Ostendaise Lumière et Force Motrice are, it is stated, making good progress with the coke-oven plant they are erecting near Zandvoorde, on the canal from Bruges to Ostend, some particulars in regard to which were given in the "JOURNAL" for the 15th of August last year, and in subsequent issues. To begin with, a battery of fifty units with bye-product recovery plant is now constructing; the gas obtained being used to supply Ostend and a number of neighbouring communes. The surplus gas is to be utilized for generating electricity, which the Company are also entitled to supply; and their operations are expected to start during the first quarter of next year.

FATAL GAS EXPLOSION AT HAMPSTEAD.

At the Hampstead Dispensary Hall, on Monday last week, Mr. Walter Schröder concluded an inquiry into the circumstances attending the death of Mary Ann Newport (70), a widow, residing in Alexandra Mews, Abbey Road, South Hampstead, which occurred, as the result of burns, at the Hampstead General Hospital on the 21st ult.

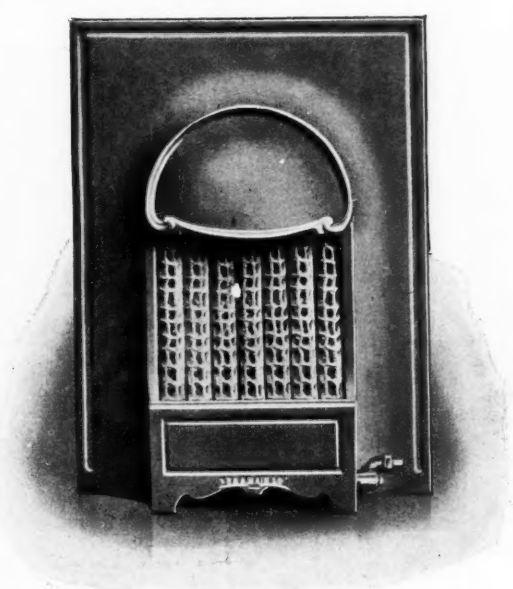
The deceased was a laundress; and on the 9th ult, after having placed four pennies in the prepayment gas-meter, she went into another room for some clothes, and on her return put a lighted match to the stove, which resulted in an explosion, setting her clothes on fire and causing severe burns. It appeared that she had complained to her daughter about an escape of gas; and they communicated with the Gaslight and Coke Company, who sent and had the stove taken to pieces. The deceased gradually became worse, and was removed to the Hampstead Hospital, where bronchitis supervened, and she died. An inquest was opened on the 25th, and several witnesses having been called, stating that they heard an explosion of gas, and that flames were coming from the window of deceased's room, the Coroner decided, as some of the evidence suggested that complaint had been made to the Gas Company about an escape, to adjourn the inquiry for a week to enable them to be represented. On resuming, Mr. C. Beasley Robinson (Messrs. Monier-Williams, Robinson, and Milroy) attended on behalf of the Company.

The first witness was Luther Thomas James, who stated that on the 9th ult. he was in a workshop underneath the apartment in which the fire occurred. He heard an explosion, and on going upstairs met the deceased coming out of her room. There was no gas, lamp, or candle alight, nor did he detect any odour of gas. Another witness deposed to seeing the deceased with what he thought to be her hair and the remains of a celluloid comb burning. Frank Pope, a police-constable, said he went to Alexandra Mews on the day of the accident, and saw the deceased, who told him that something had happened to the gas. He went to the stove, and found the gas was turned off there, but was on at the meter. He could not smell any gas.

Evidence was then given by employees of the Company. Robert Fowler, a gas-fitter's mate, deposed that on the day in question he went to the house and found the gas-meter was only half turned off. It was very stiff. He saw the deceased, but she did not say anything as to the cause of the explosion. He took down a small piece of pendant, which was hanging by only one thread, and came off easily. He did not examine the gas-stove. Mr. Thomas Vaughan Fenn, a Divisional Chief Inspector, said he had searched the records at the Company's Kilburn branch, and there had not been any complaint made of an escape of gas, or it would have been attended to at once. Mr. T. Pedlar, an Inspector, said he visited the place on the 11th ult., and found the tap of the meter was turned off, as well as those on the stove. There was no defect anywhere. The conclusion he came to as to the cause of the accident was that, the prepayment meter having stopped, the deceased put some coins into it, left the taps on, went into another room, and returned with a light, which ignited the gas escaping from the stove, and caused the explosion. In answer to Mr. Robinson, witness said the meter was back at *zero*, and consequently there would be only a few feet of gas in it. He understood that the deceased put in coins to the amount of 4d., which would, of course, cause a sudden rush of gas,

A London County Council Inspector, Mr. Alfred Butler, said he visited the place on the 28th ult., when everything was in good order, and the taps were perfectly right. If the deceased was wearing a celluloid comb, he could quite understand it catching fire and burning her hair, as deposed to by one of the witnesses. He added that he should like to show the Jury how rapidly celluloid burnt. [Witness lighted a Christmas card and an imitation tortoise-shell comb and demonstrated what he had stated.]

The Coroner having summed up the case, the Jury found that the deceased met her death by accident caused by an escape of gas, and expressed the opinion that "she turned the gas on, then went into another room, and came back to relight it."



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CHURCH STRETTON WATER ARBITRATION.

Second Day's Proceedings Continued.

Arbitration proceedings in accordance with the provisions of the Lands Clauses Act in respect of the purchase of lands otherwise than by agreement, took place recently at the Surveyors' Institution, Great George Street, S.W., to determine the price to be paid by the Church Stretton Urban District Council for the undertaking of the Church Stretton Water-Works Company, Limited. Mr. A. J. RAM, K.C., officiated as Arbitrator. The case for the Company was given in the "JOURNAL" for Nov. 26 (p. 692).

Mr. BALFOUR BROWNE, K.C., and Mr. CROSSMAN (instructed by Messrs. Oliver Richards and Parker) appeared for the Company; Mr. ALEXANDER WEDDERBURN, K.C., and Mr. A. GRAHAM (instructed by Messrs. Baker and Sons) represented the Council.

THE CASE FOR THE COUNCIL.

Mr. *James Diggle*, in answer to Mr. WEDDERBURN, said he had twice inspected Church Stretton and the Water Company's area of supply and works, and he had further considered the financial tables that had been put in. He had prepared a valuation of the undertaking upon the basis that the shareholders were entitled to be put in an equal position to earn the same income in future as they now did by their shares in the present Company. That was to say, they ought to have the same income on equal security. He did not know of any ordinary shares or stock in a water company which yielded less than 4¼ per cent. to the investor. He would say that 20 years' purchase was a fair figure for a small Company like this—assuming it to be a perfect undertaking; but this concern was imperfect, and therefore the 20 years would have to be considerably reduced. He would regard 25 years' purchase as the maximum for any water undertaking in England, with a large reserve fund, a large surplus income, and its works in a most efficient condition, with practically no faults or blemishes whatever. In the present case, he thought he would be able to show that 15 years would be a liberal price to pay. It was a very small undertaking, with a very large capital. He had never had to deal with a case in which the material provided by the company was of so scanty a description as regarded gaugings and figures, though Mr. Taylor had given them what he could. As to filtration, he agreed with the Medical Officer of Health that any water derived from the Town Brook Hollow supply should be filtered. He had seen a 4-inch pipe leading up from the dam to what he called the Motts Road Stream; and it connected it. On each of the two occasions he had been there, water was flowing through the pipe to the dam, and thence into the reservoir. Each time there was a large stream. Really, they had pipes abstracting from both streams. There was no ground for saying that the pipe at the Motts Road Stream was in such a position that it could not take water. If there was a very small stream, it might not rise up to the pipe. He put the supply necessary for such a district at 35 gallons per head per day. Even if they took the 25 gallons mentioned by the other side, and added the 6 gallons per head for trade purposes, it would come to 31 gallons per head. The 35 gallons which he estimated would mean a total daily demand, with economy, of 132,500 gallons. He maintained that 10,000 gallons a day would represent the full supply from the Light Spout Stream; and he took the flow from the new Pool Hollow drainage area at 87,500 gallons. Thus, exclusive of the Town Brook Hollow supply, there would be a deficiency of 35,000 gallons a day, with a population of 2000. From this deficiency, he deducted 11,432 gallons for the Town Brook Hollow, leaving a present deficiency of 23,568 gallons of water per day. Under these circumstances, it was ridiculous to talk of the supply being ample for a population nearly double the existing one. In so far as the leakage from the reservoir passed into the stream, it might be regarded as fulfilling to that extent the obligation to furnish 62,500 gallons per day as compensation water; but with regard to the remainder, it was not supplied, except upon one or two days when a request was made for it by certain riparian owners. To his mind, 140 days' supply as storage was about the right figure to adopt. Any purchaser must assume that the compensation water would have to be supplied.

Mr. BALFOUR BROWNE: We have done it. We have allowed it in the calculations absolutely.

The ARBITRATOR: It is allowed in the calculations.

Examination resumed: The amount of water escaping from the reservoir was a good deal larger than that named by Mr. Brough Taylor; and he did not suppose anything they could do would stop the leakage. The fact that the reservoir leaked was a matter to be taken into consideration when assessing the value of the undertaking, because when they came to enlarge the reservoir to meet growing demands it would throw pressure on the strata to such an extent that an increased quantity of water would pass away. He did not say definitely that it would ever endanger the safety of the reservoir; this was an element of risk that they would have to take. Further storage was necessary; and this was a factor that must be taken into account in assessing the value of the undertaking. The life of a water-main he should take as 60 years, though the Local Government Board allowed one-half of this when they granted a loan. Speaking generally, any company ought to include in their accounts, for renewal of mains, a sinking fund sufficient to replace the mains at the end of 60 years. It was true that in some cases a main might last 80 years, or even longer; but, on the other hand, he knew of instances where they had only lasted 40 to 50 years. Two of the mains were too small, and some were laid with insufficient cover. Taking the mains as a whole, he should say there was not a great deal to complain about. The New Pool Hollow water should be filtered as well as the other; samples of water taken showed this. The Company had no reserve fund—no reserve of money, and no reserve of water. The dividend, if they had included in the revenue items which ought properly to be included

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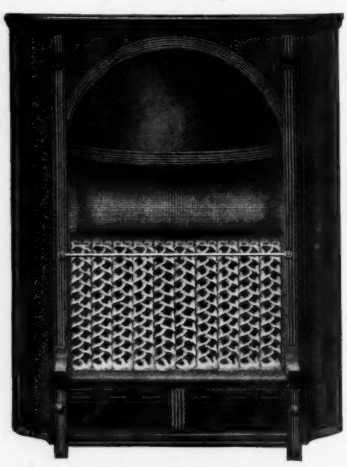

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in it, would be not 3¼ per cent., but about 1·85 per cent. During the last three years, the revenue had decreased from £741 to £701. The financial status of the Company showed that it was not by any means a secured water undertaking. He did not know of a case in which prospective value had been used for any purpose except to show that the existing revenue was secure. Apart from this, he denied that there was a prospective value in this case.

Mr. WEDDERBURN: According to the Company, the only servants they have at present are a superintendent, who for the last two years has been employed, first at about 1s. 8d. per week, and then at about 5s.; a secretary, who gets £10 a year and lives in London; and a collector, who gets his commission. Did you ever hear of a water company, however small and feeble, being administered in such a way?

Witness: Oh! dear, no. Every undertaking must have a practical water man.

The ARBITRATOR: Can you indicate anything in this undertaking which is defective or bad by reason of not having sufficient supervision?

Witness: I do not know so much about it as to be able to say that—except that I know any undertaking which goes on without a water man like this will have a large waste of water.

Examination continued: His argument was that this was not a compulsory purchase; but if something was claimed for re-investment, he said 2 per cent. was ample. He had prepared his valuation on the agreed accounts.

Third Day.

Mr. *Diggle*, re-called, and cross-examined by Mr. BALFOUR BROWNE, said he thought he would allow for prospective value, if an undertaking had sufficient water for its present demand and for a future demand, and the town was growing. A turncock would have reduced the waste, but would not have increased the income. With regard to a sinking fund to replace mains, he could not show by what authority in any Act of Parliament such a fund could be formed. Neither could he say exactly where it had ever been done. For a compulsory purchase, 2 per cent. would be a proper allowance; and in the present case it would be particularly generous, because one could hardly find a worse undertaking to invest in, and there would be no difficulty whatever in re-investing the money in a much better company.

The ARBITRATOR: Have you ever before given as low a multiplier in any case as 15?

Witness: No, I have not had a company in my opinion which has been so exceedingly bad in its finances as this Company.

What has been the lowest figure you have ever given, that you recollect?—I think the lowest figure I gave was in Worksop. I believe it was 20—speaking from memory. I have two more coming along where it will be even less than this; but I am not at liberty to mention their names at the present time.

Mr. WEDDERBURN (in re-examination): This Company, so far as arbitrations are concerned, is in your experience the limit?

Witness: Yes, quite.

Mr. *Charles Williams* said he assisted the Clerk to the Church Stretton Urban District Council. The rateable value of the urban district in the year 1911 was £14,007; on April 1, 1912, it was £14,001; and on Oct. 1 last it was £13,981.

Dr. *Maurice Gepp*, Medical Officer of Health for the Church Stretton urban district, stated that he had always advised that the Town Brook Hollow water should be filtered. There was a footpath closely bordering on the stream, and any pollution would inevitably get into the water. It was a footpath frequented by visitors and excursionists. There was also a rifle-range in the vicinity. As to the Light Spout Stream, he had recently found evidence of three camp fires, each within 10 feet of the stream, showing that picnic parties went and spent some time up there. Filtration of this water would therefore be as desirable as in the case of the other. When last on the spot, he saw a 4-inch pipe running almost full-bore; and he took it, from the position of the pipe, that this must be Motts Road water. The stream was then in average condition.

Cross-examined: He had been Medical Officer since 1899, when the district was formed; and he had never traced any disease to water carriage—they had had no typhoid. The health of Church Stretton was very good.

Mr. *S. Meeson Morris*, Clerk to the Urban District Council, said that correspondence had passed between him and the Company from time to time with reference to the fencing of the new reservoir and the filtering of the Town Brook Hollow water. He had never had any satisfactory reply from the Company with regard to the latter. On behalf of a client, he had a large claim against the Land Company; but the Receiver took possession of all the property, and it was impossible to enforce the debt.

Mr. *Horatio Barnett* said that during the last two or three years Church Stretton had been practically stationary. They were hoping for further development. He had always been in favour of an urban council having possession of its own water supply.

Mr. *Charles Simpson*, a plumber, living in Church Stretton, gave evidence as to a main which he said at one point had a foot of cover. He was called to attend to a stoppage of water, and found the main was frozen. The water had a bad effect on lead pipes, especially if they were used for hot-water supplies. He had seen lead service-pipes which had been unable to stand the pressure. During the dry period of 1911, there was very little water in the reservoir; and not a drop of water was coming down the Carding Mill Stream. He noticed at that time some large cracks in the reservoir embankment.

Cross-examined: Some consumers on the same main were getting water when he said it was frozen; and he took it that the pipe was not frozen solid. He believed corrosion took place almost with every water where there was a hot-water system. He had never known a main to be frozen except on the one occasion he had referred to.

Mr. *E. J. Marsh*, Surveyor to the Urban District Council, said that during the summer of 1911 he frequently observed that there was not a drop of water running down the Carding Mill Stream. During last June the same thing happened at one point. He had recently seen,

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with Mr. Diggle, the Motts Road pipe taking water at full bore. He had also seen water being taken from there when the stream was very low indeed.

Mr. WEDDERBURN, in the course of his address for the Council, said there had been in Church Stretton a land boom which had never been repeated, and which, as far as one could see, was not likely to be repeated. Since 1906, the land boom being over, the place had been either stationary or on the decline. They had had Mr. Bond's candid statement of disappointment. The whole speculation of the Land Company had been a mistake. To suggest that the place, within anything like the next ten years, was going to spring to a population of 3150, was absolute nonsense. The claim of £8500 because of prospective value was an absurd and improper one. The sole question the Arbitrator had to ask himself was, "Is the existing income maintainable; can they go on earning it?" If they could go on earning it, and more, then the security was obvious. Did the Arbitrator know of any case in which prospective value had been claimed in the form in which it was claimed here? Did he know of any case in which not only were they asking for the highest number of years they could reasonably ask for on the ground that the thing was secure, but were asking also for prospective value? In the last three years the net rental had been declining, and the gross rental had remained stationary. Could anyone be at all sure that the Company would be able to go on paying the £552? In the past they had starved the administration in order to pay dividends. There were three matters which made a difference of £138 in expenses. They were the question of a sinking fund to replace mains, the provision of a water man, and an allowance for director's fees. All these ought to be provided for. If this was right, the net maintainable income was not sufficient for them to go on paying 3¼ per cent. The utmost they could maintain their income at was £571, of which £170 had to be taken for interest on mortgages. As to the number of years' purchase, the average yield of other good water-works undertakings was £4 8s 2d. per cent.; and this Company ought to yield more. They could go on the market and buy companies on a basis of 22¾ years. Mr. Diggle said in no case would he give 26 years. Here, assuming the yield had got to be 5 per cent., then, if perfect, 20 years was a fair basis to take. The 15 years that had been suggested for this undertaking did at first sight strike one as being small; but had they ever had to do with such a Company as this? It was the poorest, worst managed, lowest-class Company with which one had ever had to deal. Assuming that they fulfilled their obligations, and were limited to their rights, what was their position with regard to their sources of supply? With a population of 1780 people, at a time when they were giving no compensation water except on two days, they ran absolutely short of water; and when they were doing this, they were taking water from the Motts Road Stream, which they were not entitled to take. Of course, the main difference between Mr. Brough Taylor and Mr. Diggle was the 25 gallons per head per day or the 35 gallons. In a watering-place like Church Stretton the consumption was notoriously large. Another element of risk was the question of whether they were entitled to take from the Light Spout Stream more than the 10,000 gallons which they told Parliament they would take in times of flood. There was also the non-statutory character of the Town Brook Hollow reservoir, which was purchased from a non-statutory Company. The capacity of the works had to be considered; and the mains and services were a further admitted element of insecurity. Another matter that had to be considered was the question of filtration. Then there was the compensation water. They could not assume that this would never have to be given; and if the Company ran quite dry in 1911, when they were not giving it, what would their position be if they were compelled to give it in full? The truth was the position of the Company was altogether insecure. The provision that the purchasers must pay the cost of the Company's Act (£1800) was to secure that, if the Company was bought out immediately, they should at any rate get their expenditure back. This was very different from their having had ten years' run, and now seeking to get the advantage of the whole of this, and in addition the £1800. The section was intended to apply if the purchasers came forward to buy at the time when the Company had not had full opportunity of recouping their expenses. This was not a case in which the Company were entitled to anything for compulsory purchase. The Act said they should only have the right to supply water on condition that they were willing to sell the undertaking. Every shareholder must be presumed to have known that he took his shares subject to being bought out as a willing seller. He submitted that they were not entitled to anything for compulsory sale; but Mr. Diggle, upon this basis, had allowed them 2 per cent. In every arbitration there was talk about 10 per cent.; and it was all summed up in this: It was always claimed by the people who were wanting to get as much as they could; but nobody knew whether it was always given. The Arbitrator gave what he thought fit, according to the circumstances of the case.

The ARBITRATOR: I sat on one happy arbitration recently [Slough] where the Act of Parliament said they were to have 10 per cent.; and we had no talk about it there with them.

Mr. WEDDERBURN: That they should ask for 10 per cent. here, and also ask for their bonus of £1800, passes belief.

The ARBITRATOR: The £1800 is not asked for, but is given by the Act.

THE REPLY FOR THE COMPANY.

Mr. BALFOUR BROWNE, in summing up the case for the Company, said the future of the undertaking was exceedingly well secured by a rising population; and the water was perfectly good. The Company had been excellently managed; and it was worth 26 years' purchase. Between 1901 and 1911, the increase in population had been 58 per cent.; and it was fair to assume that it would continue to increase. It was a wrong principle to say that prospective value could only be used as giving strength or security. Mr. Diggle admitted with perfect candour that if the Company had more water than was necessary to supply the present population, and if the population was increasing, it would have a prospective value. The whole question of prospective value

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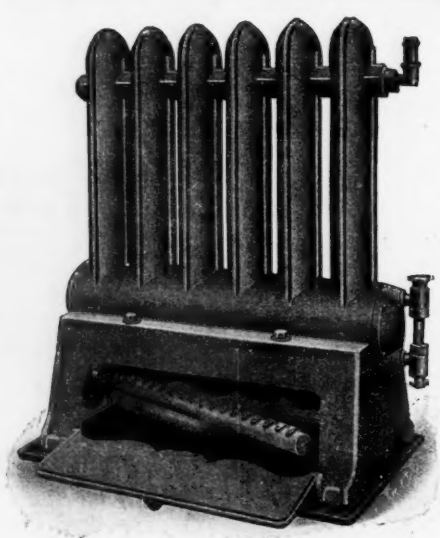

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depended upon these facts; and he maintained that the Company had ample water to supply the population up to 1923, when it would number 3062. There was no reason to suppose that the Company would have been more expensive to manage next year than last. Of course, the expenditure side should be adjusted if the Council could show distinctly that further expenses than those already incurred would have been incurred—not by the Council, but the Company. This, however, they had not done. Mr. Diggle had never seen a sinking fund formed to replace mains; and there was no such thing recognized by Parliament. The mains ought to be, and by theory were, kept in a fair condition to command the rent, not by a sinking fund, but by annual repairs; and when a pipe became worn out, it should be taken up and replaced. If it was a 3-inch pipe, and a 3-inch pipe was put down in its place, Mr. Diggle agreed that it ought to be paid for out of revenue. If, on the other hand, a 3-inch pipe was taken up, and a 4-inch pipe put down, a proportion for the extra size should be paid for out of capital. As to the £78 suggested for a turncock, the Company already had a man who was capable of doing all that was required. If the Directors held shares, why should they be compelled to take fees in addition to their dividends? Why should Mr. Diggle suggest 15 years' purchase, when it had never been given before? The only ground which he thought could justify Mr. Diggle was the attempt to show that the Company had a deficiency of water for present demands, and no prospective value. Mr. Diggle had put into his calculations a consumption of 35 gallons per head per day, merely in order to swell the demands which had been made upon the Company—demands which they had met absolutely satisfactorily, except in the extreme drought of 1911. On Mr. Diggle's own showing, the Company had ample water to meet the whole of the demands of the district. There was a certain proportion of water unimpounded, and a quantity resulting from leakage, which went towards the 62,500 gallons of compensation water which the Act said the Company should permit to flow into the Carding Mill Stream every 24 hours. As to the 10,000 gallons of water from the Light Spout Hollow, he maintained that the Company had an absolute right to take every drop of water above their intake; and the intake was to be on the Carding Mill Stream. Everybody seemed to have been content with the quality of the water; and Dr. Rideal's analyses had shown that there was no evidence of anything in it calling for filtration. With regard to the question of whether it was a compulsory sale, he did not know what could put a man under greater compulsion than when an Act of Parliament said he should not oppose the acquisition of the undertaking. Then the Act went on: "Provided that, in addition to the sum to be paid by the Council or Councils to the Company under the foregoing provisions of this section, the Council or Councils shall pay to the Company the actual costs of obtaining this Act, and the costs of, and incidental to, the winding-up of the Company." It was clear, therefore, that this was to be a bonus in addition to the purchase-price. Mr. Diggle was entirely wrong when he tried to take off the £1800 for these costs, or the 3¼ per cent. upon it, which amounted to £58 10s. Now, what was the proper number of years' purchase. He thought it ought to be 26 years, on the ground that, instead of being one of the worst undertakings, it was one of the best little companies.

Thus ended the proceedings; the Arbitrator reserving his award.

LONDONDERRY WATER SUPPLY.

At a recent Special Meeting of the Londonderry Corporation—the Mayor (Mr. John M'Farland) presiding—a motion to rescind a resolution for the completion of the Burngibbah auxiliary water supply scheme was defeated by a majority of two votes. The Mayor stated that two schemes had been put forward—one of which, that of Sheriff's Mountain, had been already carried out. The other was the Burngibbah scheme. By the former, they had obtained a substantial supply of water, which was at present augmented by one of the greatest surpluses they had had in the reservoirs for years. Wells sunk by manufacturers and others had been a further source of supply—to such an extent, indeed, that the water revenue from manufactures had dropped to about one-half. Altogether, they had spent upwards of £3000 on the Burngibbah scheme, and, in his opinion, it was not worth the money estimated as required for it. If they went on with it, they would have to increase the borough rate probably by about 7d. in the pound, whereas by abandoning it, there would be a probable reduction to this extent. Mr. M'Gahey, who moved to rescind the resolution, urged that filtration was of more importance to the citizens at present than taking steps to augment an already substantial water supply. Alderman Anderson said that, though they had improved the supply, the water problem was not yet settled. They had obtained an additional 3 to 3½ gallons per head per day; but this was not sufficient to tide over possible critical times, especially in view of the prospect that the city's population would increase by from 4000 to 10,000 during the next ten years. He believed that the majority of the citizens favoured the Burngibbah scheme. Mr. M'Carron moved an amendment, that consideration of the matter should be postponed for a month, to allow figures to be prepared. Mr. M'Cully said the Burngibbah scheme was the only one to safeguard the city against a dearth of water for the next ten or fifteen years. On the other hand, Mr. Coghlan thought that, with the great surplus of water they now possessed, they should not saddle the ratepayers with more cost. On a division, 13 voted for the amendment and 13 against, and the Mayor gave his casting vote against. Mr. M'Gahey's motion was then put, with the result already stated.

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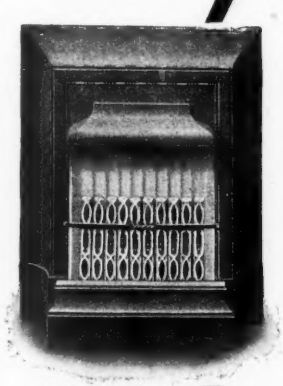

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THERE are few, if any, Gas Managers in the Kingdom who are not acquainted with CARRON GAS FIRES. There may be some, however, who are not acquainted with their merit—who do not know that they are FIRES APART—constructed in every detail to give the best possible service and satisfaction. The designs speak for themselves—the materials and finish are guaranteed by an enterprise of over a century and a half.

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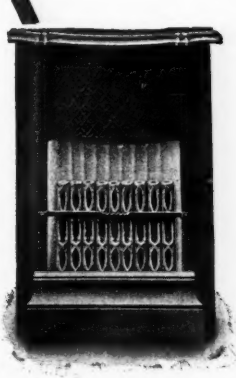


"Abbey" Series.
The
"KILWINNING."

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Aberdeen.—In connection with an important extension scheme at the gas-works, Mr. Samuel Milne, the Gas Engineer, along with Mr. Sangster, the Gas Convener, visited a number of towns in England in June, with a view to finding out the more improved methods of carbonization. In his report, the Engineer points out that an installation of vertical retorts should be put in to make an additional 1,000,000 cubic feet of gas per day. At present, 4,200,000 cubic feet of gas are manufactured per day; leaving 25,000 cubic feet as reserve. The estimated cost of the new plant is put at £19,000. The consumption of gas during the last six months shows an increase of 15·22 per cent., compared with the amount used in the corresponding period last year, which is equal to 45,804,000 cubic feet. This increase is due in a great measure to the policy adopted by the Council about a year ago in giving free cookers, and also to the increased use of gas-fires. As a result, it has become necessary, in view of the fact that the daily maximum make of gas is approximately up to the producing power, to instal additional plant before another winter. The consumption due to cooking-stoves is not merely a summer demand, as has been made abundantly clear from the fact that the average rate of increase per day during the summer months was maintained. The proposal is to adopt vertical retorts on the continuous carbonization system.

Dunfermline.—The Gas Committee of the Dunfermline Town Council have recommended that a charge of 3s. 9d. per 1000 cubic feet of gas should be made to consumers by ordinary meter, and 4s. 3d. to those using prepayment meters.

Perth.—Mr. Gillespie, of Glasgow, has been appointed to inquire into the condition of the gas-works. Numerous complaints have recently been made as to the quantity and quality of the gas supply of the city; and the rumours which are prevalent with regard to the gas-works have caused a feeling of uneasiness in municipal and other circles. In quite a number of cases, householders state that they have been unable to get sufficient light, while shopkeepers have been greatly inconvenienced.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 7.

Sulphate of Ammonia.

The improvement in the demand from middlemen for early shipment has continued throughout the week, and available supplies have been disposed of without difficulty at some further increase in prices. There has, however, still been a paucity of fresh orders from abroad, direct buyers having remained content to look on for the time being. The closing quotations are £13 18s. 9d. to £14 per ton f.o.b. Hull, £14 to £14 1s. 3d. per ton f.o.b. Liverpool, and £14 1s. 3d. to £14 2s. 6d. per ton f.o.b. Leith. In the future positions, little new business has transpired; but the better tone for prompt delivery is having the effect of again stiffening manufacturers in their ideas for next year.

Nitrate of Soda.

The tone of this market is rather easier, and quotations have now been reduced to 11s. 7½d. per cwt. for ordinary, and 11s. 9d. for refined quality, on spot.

LONDON, *Dec.* 9.

Tar Products.

The markets for tar products remain fairly steady; and there is not much alteration in prices. Pitch is unchanged; and the inquiry of last week has not had any material effect on the price. Benzols remain in the same position; but it is very difficult to arrange further contracts unless the price is lowered. In solvent naphtha, there has been a little more offering of late. Heavy naphthas are steady, and the price is unchanged. Creosote is very firm; and further contracts are reported at the equivalent of to-day's quotations. Crude carbolic is a purely nominal value. Some fairly high prices are reported for prompt delivery; but for forward, consumers state that they are offered parcels in the neighbourhood of 1s. 10d. to 2s. per gallon.

The average values during the week were: Tar, 26s. 9d. to 30s. 9d. Pitch, London, 43s. to 43s. 6d.; east coast, 43s. to 43s. 6d.; west coast, Clyde, 43s. to 43s. 6d.; Manchester, 40s. 6d. to 41s. 6d.; Liverpool, 41s. to 42s. 6d. Benzol, 90 per cent., naked, London, 11d. to 11¼d.; North, 10d. to 10½d.; 50-90 per cent., naked, London, 11d.; North, 10¼d. to 10¾d. Toluol, naked, London, 11d. to 11¼d.; North, 10¼d. to 11d. Crude naphtha, in bulk, London, 5¼d. to 5⅜d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d.; North, 1s. 1½d. to 1s. 2d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10½d. to 11d. f.o.b. Creosote, in bulk, London, 3½d. to 3¾d.; North, 3d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 3½d. Carbolic acid, casks included, 60 per cent., prompt east and west coasts, 2s. 3d. to 2s. 4d.; forward 1s. 11d. to 2s. nominal. Naphthalene, £5 to £9; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is steady, though there is very little alteration in the prices. The prompt inquiry is not having any material effect, and there seems to have been plenty of sulphate to meet the present demand. Outside London makes are £13 5s to £13 6s. 3d.; Hull, £13 18s. 9d.; Liverpool, £13 18s. 9d.; Leith, £14; and Middlesbrough, £13 18s. 9d.

A temporary shortage in the gas supply was experienced at Unsworth on the evening of last Wednesday week. The explanation of the occurrence given in a local paper is that, owing to road improvements, one of the mains was cut, and the second main "failed to come up to expectations in the supply," with the result that streets were in darkness and buildings had to be lighted with candles and oil lamps. One lantern lecture suffered greatly.

THE "A TO Z" LAMP

THE ONLY LAMP OFFERED UNDER SUCH CONDITIONS.

WITH FERGUSON'S PATENT "LIFT-OFF" BURNER

LET YOUR FITTERS' MATES PUT THEM TOGETHER.

MUST APPEAL TO GAS ENGINEERS.

"COMPARISON."

12

3-LIGHT LAMPS

PACKED UNDER LOOSE PART CONDITIONS AS SHOWN.

COPPER. ENAMEL.

Measurement of case for either.

54 × 40 × 24

NET WEIGHT OF MATERIAL.

COPPER LAMPS.				ENAMEL LAMPS.			
cwt.	qrs.	lbs.	ozs.	cwt.	qrs.	lbs.	ozs.
1	3	8	0	1	3	18	8

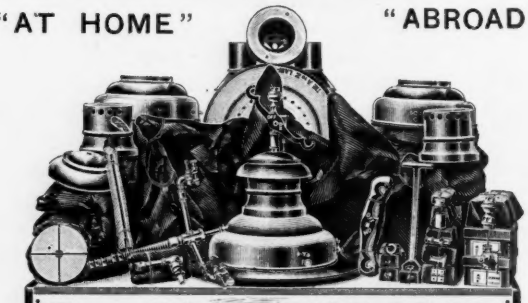
GROSS WEIGHT PACKED.

COPPER.				ENAMEL.			
cwt.	qrs.	lbs.	ozs.	cwt.	qrs.	lbs.	ozs.
3	2	0	0	3	2	10	8

Packing Case ¾ Stuff, 1 in. Ends, Battened Inside.
Hoop Iron each end.
Fitted Iron Bolts and Nuts, "LIFT OFF" Lid.
Easy for you. Easy for us.

Send for our Special Packing Particulars, with net and gross weights.

"AT HOME" "ABROAD"



THE "A TO Z" LAMP

FOR HOME (FERGUSON'S PATENT) FOR ABROAD

CONTENTS.

1 3 LIGHT "A TO Z" OUTDOOR PATTERN LAMP EITHER IN COPPER OR ENAMELLED STEEL COMPLETE, LESS GLASS & MANTLES, TESTED READY FOR FIXING.

11 DITTO IN PARTS, AS SHOWN ABOVE

12 LAMPS IN ALL 480 OR 750 CANDLE POWER.

REDUCE YOUR FREIGHT COSTS.

"COMPARISON."

12

3-LIGHT LAMPS

PACKED COMPLETE. TESTED READY FOR FIXING.

COPPER. ENAMEL.

Measurement of case for either.

60 × 56 × 28

NET WEIGHT OF MATERIAL.

COPPER LAMPS.				ENAMEL LAMPS.			
cwt.	qrs.	lbs.	ozs.	cwt.	qrs.	lbs.	ozs.
1	3	8	0	1	3	18	8

GROSS WEIGHT PACKED.

COPPER.				ENAMEL.			
cwt.	qrs.	lbs.	ozs.	cwt.	qrs.	lbs.	ozs.
5	0	0	0	5	0	15	0

If Home Trade, Full Credit given if returned sound with Packing.
Blue Print Enclosed Showing Construction, and Instructions for Fitting together. Let your Foreman visit our Works.
Only ONE Special TOOL required. We Enclose it. You have the rest.

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THE "A TO Z" INVERTED GAS LAMP AND FITTINGS CO., Limited

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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is very brisk in the north-east; and there is now a pressure for supplies which is likely to continue until the coming holidays are over. In the steam coal trade, the heavy Russian demand is still felt; and best Northumbrian steams are from 14s. 9d. to 15s. per ton f.o.b. For second-class steams, about 13s. 6d. per ton is the current quotation; and for steam smalls, from 10s. to 11s. 3d. The output is full, and is readily taken up. In the gas coal trade, the consumption is now at about its highest point, and the prices are strengthened by the heavy demand both for home and foreign use. Best Durham gas coals are raised to 15s. 9d. to 16s. per ton f.o.b.; second-class are 14s. 6d. to 15s.; and "Wear" specials are about 16s. 6d. per ton—the latter class being scarce. There are few new contracts being settled at the moment. On those now current, there is a very strong demand, which is fairly met, but which takes up the bulk of the production; while it is evident that the output will be much lower for the last week of this month, with a consumption so heavy that it must reduce stocks. Coke is very firm. For gas coke, there is an ease through the larger production at present. Good gas coke is from 21s. 6d. to 22s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The coal trade throughout Scotland rules steady in all departments. On Friday, the following were the prices quoted f.o.b. Glasgow: Steam coal, 11s. 6d. to 12s.; splint, 14s. to 14s. 6d.; ell, 12s. 3d. to 12s. 9d.; trebles, 13s. to 13s. 6d.; doubles, 12s. 6d. to 13s.; and singles, 12s. to 12s. 6d.

Metropolitan Water Board's Reservoir at Chingford.—At the meeting of the Waltham Urban District Council last Tuesday, it was announced that the King had consented to open the new reservoir of the Metropolitan Water Board at Chingford in February next. It is proposed that the King, travelling by motor-car, shall arrive at the Enfield end of the reservoir, leave by the gates on the Ponders End road, and pass through Buckhurst Hill and Woodford. The Council passed a resolution asking that the King should visit Waltham Abbey on the occasion.

High-Power Gas-Lamps in Lewisham.—The Lewisham Borough Council have granted an application from the South Metropolitan Gas Company for permission to fix eleven high-power gas-lamps in Burnt Ash Road, subject to protective conditions; and the Company undertaking to supply and light one public street-lamp free of charge to the Council for every twelve special standards erected. Previous to this application, the South Metropolitan Electric Light and Power Company, Limited, applied for permission to erect seven standard arc lamps; but they were not put up. The Gas Company then moved in the matter, with the result stated.

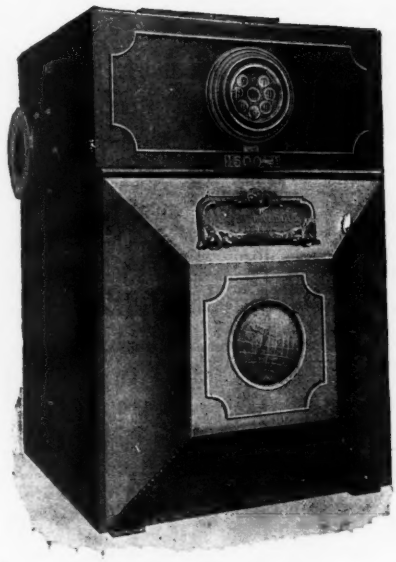
Electric Light Failures and Fires.

The failure of the electric light in the St. Michel and St. Germain quarters of Paris on the 19th ult., already recorded in the "JOURNAL," has been quickly followed by another, which last Saturday plunged the greater portion of the city in semi-darkness for about two hours. The cause was a fire at the generating station at St. Denis, as the result of a short-circuit. The inconvenience occasioned is described as follows by the Paris Correspondent of "The Times": "The underground trains suddenly stopped, and passengers were escorted on foot by the railway servants through the tunnels to the nearest stations; the electric tramways were also stopped, and thousands of people were unable to get home in the usual way at the close of their day's work. The entrances to the Metropolitan stations were guarded by police; and in the Place de l'Opéra alone a crowd of 3000 or 4000 people awaited the reopening of the stations. The theatres were seriously affected. In some instances acetylene lamps, and even candles, were hastily improvised to light the stage." Arrangements were made by Sunday morning for utilizing an electric supply from other generating stations; but the damage at Saint Denis is very serious, and will take many days to repair. In the afternoon of that day, an outbreak of fire occurred in a building in Newgate Street, and did great damage. It was supposed to have been caused by a short-circuit in an electric lighting box. To the fusion of wires in the recently installed electric lighting apparatus at the Epping Town Hall is attributed a fire which broke out late last Friday night and gutted the building. A fire broke out about 7.30 p.m. last Tuesday at the British Museum; but it was fortunately extinguished before serious damage had been done. The outbreak occurred in the electrician's office in the basement of the east wing, and the alarm was quickly given to the Museum fire brigade and the Holborn Fire Station. In about fifteen minutes the flames were extinguished.

Sale of Lancashire Gas Shares.—At the White Swan Hotel, Rochdale, last Thursday, five £5 new shares in the Whitworth Vale Gas Company realized £8 3s. each; a like number of "B" shares, of the same nominal value, fetching £6 15s. apiece. Biddings for five £10 shares in the Littleborough Gas Company started at £20 each; and the shares finally changed hands at £25 7s. 6d. each.

Maintenance of Incandescent Mantles at Portland.—The Sub-Committee of the Portland Urban District Council have recommended that the Council should undertake the maintenance of incandescent lighting installations for private consumers at 3d. per burner per month. It is suggested that a fitter should be sent once a month to the premises of consumers to examine, clean, and regulate the burners, and supply and fix new mantles and chimneys when necessary, or, on application, to clean and adjust burners and fix new mantles free of cost as regards men's time, charging only for articles supplied. The recommendation has been adopted.

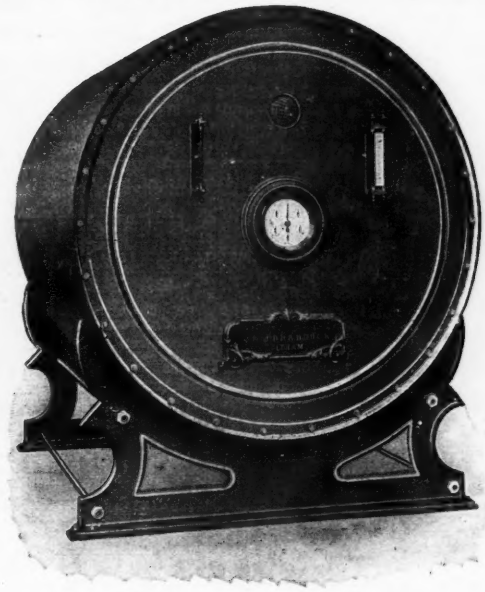
BRADDOCK'S IMPROVED GAS METERS



No. 219. Braddock's Large Dry Meter.

SECOND TO NONE.

Made in all Sizes.



No. 245. Braddock's Large Wet Meter.

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Colonial Gas Association, Limited.

Last Tuesday, at the Cannon Street Hotel, E.C.—Mr. Samuel Spencer in the chair—extraordinary meetings of the Colonial Gas Association, Limited, were held, at which the following resolution was passed: "(*a*) That the sum of £600 be paid out of the Company's reserve fund to the holders of the founders' shares in the Company's capital as on Dec. 3, 1912, rateably in proportion to the number of such shares held by them respectively—being a payment of £10 in respect of each such share. (*b*) That each of the said founders' shares (which are at present of £10 each) be subdivided into two shares of £5 each. (*c*) That the new shares each of £5 resulting from such subdivision be converted into ordinary shares, forming with the existing ordinary shares in the Company's capital a single class of 50,000 ordinary shares each of £5, ranking in all respects *pari passu* with one another. (*d*) That the Company's Memorandum and Articles of Association be read subject to the foregoing provisions and as varied thereby, and so that no consent on the part of founders shall be required for any future distribution of reserve funds among the shareholders." The Chairman pointed out that the idea of the scheme was, of course, to get rid of the founders' shares as a separate block of shares. The proposal was that each founders' share of £10 should be converted into two shares of £5 each, and merge into the ordinary capital of the Company; and that, to make up to the founders for the difference in their shares, each founders' share would receive from the Company's reserve fund a sum of £10 as a payment to the founder shareholder.

Blackpool Gas-Works Extensions.—A recommendation of the Gas Committee of the Blackpool Corporation that application should be made to the Local Government Board for sanction to the borrowing of £31,750 for gas-works extensions was approved by the Town Council at last Wednesday's meeting. Alderman Grime congratulated the Committee on being progressive, "even though it was late in the day." Gas, in its application to lighting and other purposes, was, he observed, moving rapidly; and it was desirable that Blackpool should keep abreast of improvements. One thing that pleased him in this connection was the Committee's decision greatly to extend the high-pressure gas system in the main parts of the town.

Gas Explosion in Liverpool.—On Monday morning last week a serious gas explosion occurred on the premises of Messrs. Hutchinson and Co., in Whitechapel, Liverpool. One of their employees, on opening the premises, perceived a strong odour of gas. Having opened the windows, he tried the gas-brackets, and found the gas had been duly shut off. He then turned his attention to the meter, and observing a flame starting from it, he filled his cap with water which he poured on to the meter. Shortly afterwards an explosion occurred; and it was presumed that the gas had been escaping during the night, and had accumulated in the floor of the first storey. Fortunately, the whole of the staff had not arrived when the explosion took place.

New Gas Offices at St. Helens.

On Wednesday last, the members of the St. Helens Town Council were conveyed in a special tramcar to the gas-works in Warrington Old Road, where new offices and show-rooms were formally opened. When the outside of the building was reached, Alderman Forster, on behalf of the Gas Committee, asked the Mayor (Mr. James Crooks), who is also Chairman of the Gas Committee, to accept from the Council a golden key for the purpose of opening the premises. He remarked that the Mayor had rendered valuable service to the Committee for some years. He took an interest in everything that was going on, and was one of that kind of chairmen whom the Engineer and Manager (Mr. Samuel Glover) could always get at and talk to in a friendly and brotherly fashion. This was certainly the best way to carry on a concern like the gas undertaking, from which the Corporation had received enormous benefits. The Mayor having opened the door, the company passed into the Manager's office, and refreshments were served. In declaring the building open, the Mayor said it would not only meet the need for better accommodation, but would constitute a desirable public improvement. All concerned in its erection were to be congratulated upon their excellent work. The citizens had every reason to be proud of their gas estate, which was looked upon as one of the most valuable assets the town possessed. He found that 78 years ago gas produced on a part of the present site of the works was sold at 10s. 6d. per 1000 cubic feet, as compared with the 2s. of to-day; and he understood the Corporation were the first to supply gas cookers and fires rent free, and also one of the first to abolish meter-rents. After inspecting the new offices and show-rooms, the party visited the gas-works, where, among other things, they saw the vertical retort installation, regarding the working of which the Mayor had remarked that Mr. Glover and Mr. West would be delighted to give every information.

Magnitude of London's Water Supply.—In a lecture on "London's Water Supply," recently given by Mr. E. B. Barnard, the Chairman of the Metropolitan Water Board, to a gathering of members of the United Wards Club, he expressed the opinion that such a commodity as water, affecting as it does the lives and interests of about 7 million souls in London, should be free from the temptation to make profit. All water supplies were best in the hands of a municipality. He went on to say that during the year 1911-12, 89,437 million gallons of water were supplied to a population of 6,700,000. This huge quantity of water would fill a canal 600 miles long, 200 feet wide, and 23 feet deep, reaching from Land's End to John o' Groats. The Board had 6334 miles of water-pipes in the Metropolis, and the services numbered 1,100,000. The average daily supply of water amounted to 244 million gallons; and on one hot day last year it rose to 315 million gallons. The daily supply per head averaged 38½ gallons; and the Board had storage reservoirs large enough to hold nearly 10,000 million gallons of water. They also had 171 filter-beds, covering 169 acres.

THE PIONEERS OF THE SLOT METER.

FIRST IN 1889.

THE INTRODUCTION OF THE SLOT METER.

WRITING to supplement the information given in our "Questions and Answers" column last week with regard to the introduction of the slot meter, a correspondent says that the first patentee was Mr. W. Brownhill, but his meter was never in practical use. The first Gas Company to supply gas in quantity through slot meters was the Liverpool United Gas Company. They supplied gas in bulk to the Corporation for the artisans' dwellings in Casino Street, Liverpool. The Corporation fixed 50 penny-in-the-slot meters in these dwellings. The meters were Thorp and Marsh's patent, and they were manufactured by Messrs. Sawer and Purves. The meters were fixed for six months on approval, at the end of which time the Corporation had to decide whether they were a success or failure. Mr. Marsh entered into a guarantee that the meters should be satisfactory, and he undertook liability for any accident that might occur. Our correspondent adds that he has no hesitation in saying that Sir George Livesey was the first man controlling a gas undertaking to strenuously advocate the use of the slot meter.

GAS v. ELECTRICITY

(From the GAS WORLD.)

FOREMOST 1912.

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(BRANCH OF METERS LIMITED)

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Agent for Scotland: JNO. D. GIBSON, 2, Causeyside Street, PAISLEY.

Power Gas Corporation, Limited.

In the report of the Directors of this Company to be submitted to the shareholders at the ordinary general meeting next Tuesday, they state that the works of Messrs. Ashmore, Benson, Pease, and Co., Limited, have been maintained in a condition of efficiency and repair, and all expenditure for this purpose has been charged to revenue. Unfortunately, the national coal strike caused a serious reduction in the output of the works and greatly retarded the execution of contracts; so that the profits for the year are substantially less on this account. The results of the trading of the Stockton firm for the year ended Sept. 30 show a total profit of £6752, to which has been added the balance of £3609 brought forward; making together £10,361. Of this, £1500 has been transferred to the reserve, £7500 to the accounts of the Corporation for dividend, and the balance carried forward. The results of the year's trading of the Corporation show a total profit of £11,852, to which has been added £3264 brought forward; making together £15,116. This the Directors propose to apply as follows: To the reserve fund, £2000; dividend at 4 per cent. per annum upon the ordinary shares, to be paid less income-tax, £9985; balance to be carried forward, £3131.

Loughborough Gas Supply.—At the last meeting of the Loughborough Town Council, a statement of the accounts of the gas undertaking for the half year ended Sept. 30 was presented. The manufacture of gas cost £4672; distribution, £882; public lamps, £181; rent, rates, and taxes, £374, and management, £279—making a total of £6389. For the sale of gas, £6389 was received; residuals produced £1985; rent of stoves, £158; slot installations, £776; public lamps, £169; and services, £4—making a total of £9481, and leaving a profit on the revenue account of £3092.

Gas Agitation at Skegness.—A local correspondent writes: "Residents at Skegness, the popular Lincolnshire seaside resort, are being whipped into a fury through the alleged *laches* of the local Gas Company, who possess the statutory powers of supply. The proposal is now seriously mooted that the Urban District Council, who have had much contention with the Company, should themselves obtain parliamentary powers to promote an independent service. The grievance which has arisen depends primarily upon the assertion that the illuminating power of the gas is much below the required standard, and that it amounts in fact to only 12-candle strength. Incidentally, there are also the complaints that the price charged is exorbitant, that no proper room for testing the gas has been provided, and that in a variety of ways the statutory regulations are being contravened. An order has been obtained, through the Court of Quarter Sessions, giving authority for an accountant's inspection (which has not yet been completed) of the books of the Company, as a basis for determining whether the Directors can be deemed to be in a position to make a reduction in price and an improvement in quality. There are therefore all the elements involved in the matter pointing a very stormy period."

Fresh Issues of Gas and Water Capital.—Three new issues of gas and water capital, by order of Directors, constituted the sale conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, last Tuesday. The Harrow and Stanmore Gas Company had for disposal 300 "C" shares of £10 each, ranking for a standard dividend of 7 per cent., subject to the sliding-scale, equally with the existing similar shares, the dividend on which for the year ended the 30th of June last was paid at the rate of £7 14s. per cent. per annum. They were all sold at from £15 to £15 7s. 6d. each, *cum div.* as from the 1st prox. Some 4 per cent. perpetual debenture stock of the Southend Water Company was placed at par. Similar stock of the East Grinstead Gas and Water Company fetched £90 per £100 of stock; and some £10 "C" shares, ranking for a maximum dividend of 7 per cent., but carrying £6 13s. per cent., were all sold at £11 to £11 7s. 6d. apiece.

APPLICATIONS FOR LETTERS PATENT.

27,033.—Thorp, F. & H. T., "Gas-burner." Nov. 25.
27,051.—Rollason, A., "Preventing destruction of fire-brick." Nov. 25.
27,075.—Morin, A. A. E., "Cocks." Nov. 25.
27,116.—Greenwood, S. J., and Watson, A. E., "Stopping flow from a burst pipe." Nov. 25.
27,122.—Moffat, Ross, and Co., Ltd., and Neumeister, C. W., "Mantles." Nov. 25.
27,124.—Reilly, G. A. G., "Incandescent gaslight burner." Nov. 25.
27,137.—Scott, E. K., "Steam-boiler for gas-firing." Nov. 26.
27,139.—Mitchell, G. H., and Draysey, W. H., "Controlling the flow of fluids." Nov. 26.
27,202.—French-Brewster, A. O, and the Atlas Non-Puncture Inner Case Syndicate, Ltd., "Compressing gas." Nov. 26.
27,305.—Hotton, W., Breton, G. A., and Hotton, F. W., "Distance gas-lighters." Nov. 27.
27,308.—Allen, T. G., and the Allen-Liversidge Portable Acetylene Company, Ltd., "Acetylene generators." Nov. 27.
27,417.—Theisen, H. E., "Purifying gases." Nov. 28.
27,479.—Woltereck, H. C., and Moeller, J., "Distillation of bituminous material." Nov. 29.
27,507.—Leech, W. J. B., Dewart, T. W., and Collett, H. H., "Quenching coke." Nov. 29.
27,323.—Sugg, W., and Co., Ltd., and Mattock, W. G. H., "Inverted lamps." Nov. 29.
27,539.—Spreadbury, R. J., "Distance gas burner control." Nov. 29.
27,603-4.—Koenig, J., "Stop-valves." Nov. 30.
27,640.—Coombs, J. A., "Compressors." Nov. 30.

Gas Plant and all constructional Steel and Iron Work.

Specialists in Slot Meters, Ordinary Meters, Wet & Dry.

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NOTE ADDRESSES.

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Lydney Public Lighting.—At last Tuesday's meeting of the Lydney Parish Council, the Chairman (Mr. C. E. Ridler) presented a report on the negotiations with the Gas Company with regard to the lighting of the town. He said the result was that the Council had an agreement before them that day whereby they were liable to pay for 147 lamps, which would include two new ones. It had been agreed to pay 42s. per lamp instead of 43s. as in the past. They would therefore have more lamps and less to pay for them, as well as better facilities for the public at a lower cost than before. The report was adopted.

Loughborough Gas Undertaking.—When the statement of accounts relating to the working during the half year to Sept. 30 of the Loughborough Corporation gas undertaking were placed before the Town Council, the opinion was expressed that, as the profit was £400 more than in the corresponding half of the previous year, some reduction might be made in the price of gas. One member suggested that the department could easily afford a reduction of 2d. per 1000 cubic feet, to 3s. It was, however, pointed out that the Chairman of the Committee, who was absent from the meeting, had given a promise that the question should be considered at an early date. Reference was made to the coal accounts, as introducing an element of doubt regarding what it might be possible to do for the consumers.

Unprofitable Prepayment Meters at Croston.—The question of increasing the charge for gas supplied through prepayment meters was considered by the Croston (Lancs.) Urban District Council at their last meeting. Mr. H. Riding, the Surveyor, stated that from a number of these meters the yield in money was not much more than 5s. for the year, while it cost the Gas Committee something like £3 to fit a service to the meter. A sum of 5s. a year was not returning 5 per cent. on the outlay, and they were not getting any profit on the gas. Croston was one of the very few places where consumers of gas by prepayment meter were charged at the same rate as ordinary consumers. Replying to a question, Mr. Riding said each slot-meter cost about 15s. more than an ordinary one; and they were more liable to get out of order. It was eventually decided that the price of gas to consumers by prepayment meter be increased by 10d. per 1000 cubic feet.

Tar Treatment of Roads.—In the House of Commons last Wednesday, Mr. King asked the Secretary to the Treasury whether he was aware that the Road Board were making grants to local authorities for the improvement of roads, and that many roads were being improved by treating the surface with tar—thus producing "a dustless but dangerous surface, on which horses, cattle, pigs, and other animals frequently fall, whereby there arises serious damage to man and beast;" and whether he would represent to the Board that, in making grants, they should stipulate for tar-treated roads being constructed so as to be as far as possible free from this defect. In reply, Mr. Masterman said the Board were satisfied that local highway authorities were making every endeavour to construct roads with dustless surfaces suitable for animal as well as mechanical traffic.

Chorley Corporation and Borrowings for Gas-Works Purposes.—The application of the Chorley Town Council to the Local Government Board for a Provisional Order amending the local Acts so that a further sum, not exceeding £100,000, may be borrowed for gas-works purposes, was considered at an inquiry held last Tuesday, in the Chorley Town Hall, by Mr. R. C. Maxwell, one of the Board's Inspectors. It was explained by the Town Clerk (Mr. J. Mills) that originally the Corporation proposed to ask for powers to borrow £48,695, the amount estimated to be required for gas-works purposes in the next ten years. The Board, however, had suggested that, in order to avoid the necessity for applying for further powers in a short period, the Corporation should consider what the requirements of the Gas Department were likely to be in the next twenty years, and amend their application accordingly. This accounted for the increase of the figure to £100,000. Mr. Mills added that the Corporation also asked for sanction to the borrowing of £3000 for meters and £1000 for cookers—the estimated expenditure for the next three years. Evidence was given at length by Mr. J. W. Allin, the Gas Engineer and Manager, and by Mr. T. Fairbrother, the Borough Accountant. The latter stated that the existing debt on the gas-works was £88,268, and that there was a sum of £10,983 in the reserve depreciation account. There was no opposition to the application.

GAS COMPANIES' STOCK AND SHARE LIST.

Business on the Stock Exchange last week exhibited no very salient characteristic beyond its marked quietude. After war's alarms, an armistice seemed to be called there as well as on the battlefield; and markets took a breather, except in some popular speculative lines, which were quite lively. An agreeable feature was the strength of the gilt-edged group; and Consols rose steadily almost from day to day. The opening day was about the best of the week—bright and cheerful on improved promises of peace, though far from active. Gilt-edged were in fine form, and Consols advanced ¼. Rails made higher prices throughout; and the rest generally were firm. A sharp change set in on Tuesday; less sanguine views being taken of Eastern affairs. Movements were irregular, and mostly downwards; but Consols held on firmly. The tone on Wednesday was dull from sheer lifelessness; but Consols, aided by special factors, advanced. Rails were weak; and Americans had a further fall. Foreign stocks moved unevenly. Thursday was still very quiet and dull. But Consols were in good demand, and took their own line; closing at a rise of ¼. Rails were inanimate and mostly lower; and Americans drooped. On Friday, the gilt-edged brigade again gave a good lead to the rest, which they were slow to follow. Consols scored another advance; but Rails seemed devoid of life. In the Foreign Market, stocks of belligerents were left alone. Saturday was very quiet, and not inclined to improve. Government issues, however, were firm, and Consols closed at 75¼ to 75½ *ex div.*—a rise of ⅝ in the week. In the Money Market, the earlier tendency was easy; but this was followed by decided stiffening, and rates closed firm. Business in the Gas Market was on about a moderate average in point of volume; and no single stock was prominently remarkable for activity. The tone was excellent; and some nice advances were made in quotations. In Gaslight and Coke issues, the ordinary was conspicuously strong, and improved another point. Transactions ranged from 104½ up to a final mark of 106. In the secured issues, the maximum realized 84½, the preference from 100⅜ to 101¼, and the debenture from 77½ to 79. South Metropolitan was inactive but very firm, and changed hands a few times at 117¼ to 118—a rise of ½. The debenture made 77½. In Commercials, one deal in the 4 per cent. at 107½ was all. Among the Suburban and Provincial group, Alliance and Dublin was dealt in at 76¼ and 75 (a fall of 1), Bournemouth "B" at 15⅞, Brighton and Hove ordinary at 152 and 153½, South Suburban at 119 to 120½, and Tottenham "A" at 145. On the local Exchange, Sheffield "C" marked 230. Advances in quotations were also made as follows: Liverpool "A" and "B" 3 each, Tottenham "A" 1, and Newcastle and Gateshead ¼. In the Continental companies, Imperial realized from 176½ to 177¾, Union from 83 to 87½ (a rise of 5), and European from 19 to 19½. Among the undertakings of the remoter world, Monte Video changed hands at 11⅜, Oriental at 127¾ to 129 *ex div.*, Primitiva at 6 5/16 to 6 9/16, ditto preference at 5 1/16 to 5 3/16, ditto debenture at 95¼ and 95½, and River Plate debenture at 95½.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75—80	−1	6 5 0
274,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
250,000	5	Oct. 11	7⅛	Bombay, Ltd.	6⅞—7⅛	..	5 9 1
50,000	10	Aug. 29	15	Bourne- mouth Gas & Water } B 7 p.c.	29—30	..	5 0 0
332,000	10	,,	7		15¾—16½	..	4 6 2
75,000	10	,,	6		14—14½	..	4 2 9
380,000	Stk.	Aug. 14	13½	Brentford Consolidated	257—262	..	5 3 1
330,000	,,	,,	10½	Do. New	198—203	..	5 3 5
50,300	,,	,,	5	Do. 5 p.c. Pref.	116—118	..	4 4 9
206,250	,,	June 14	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
218,230	Stk.	Aug. 29	11	Brighton & Hove Orig.	210—215	..	5 2 4
244,300	,,	,,	8	Do. A Ord. Stk.	152—155	..	5 3 3
530,000	20	Sept. 27	12½	British	44½—45½	..	5 9 11
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91—93	..	4 6 0
245,771	Stk.	June 28	4	Buenos Ayres 4 p.c. Deb.	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	3½—4½	..	—
100,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	70—73	..	6 3 3
157,150	Stk.	Aug. 29	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Stk.	106—108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	101—103	..	5 3 6
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	85—88	+5	4 10 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	133—135	..	5 3 8
492,370	Stk.	—	5⅔	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,140	10	July 26	10	European, Ltd.	19—20	..	5 0 0
16,160,600	Stk.	Aug. 14	4/17/4	Gas-light and Coke } 4 p.c. Ord.	104—106	+1	4 12 0
2,600,000	,,	,,	3½		82—85	..	4 2 4
4,062,235	,,	,,	4		100—102	..	3 18 5
4,531,705	,,	June 14	3		77—79	..	3 15 11
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	91—93	..	5 7 6
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16—16½	..	6 13 4
131,000	Stk.	Sept. 13	7⅝	Ilford A and C	154—157	..	4 17 1
65,780	,,	,,	6½	Do. B	121—123	..	4 19 7
65,500	,,	June 28	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
4,940,000	Stk.	Nov. 14	9	Imperial Continental	175—180	..	5 0 0
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	86—88	..	3 19 7
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	122—125	..	4 16 0
561,000	Stk.	Aug. 29	10	Liverpool United A	223—225	+3	4 8 11
718,100	,,	,,	7	Do. B	161—163	+3	4 5 11
306,083	,,	June 28	4	Do. Deb. Stk.	100—102	..	3 18 5
63,480	Stk.	June 28	3	Maidstone 3 p.c. Deb.	69—71	..	4 4 6
75,000	5	Nov. 28	6	Malta & Mediterranean Met. of Melbourne } 4½ p.c. Deb.	4½—4¾*	..	6 6 4
250,000	100	Oct. 1	4½		99—101	..	4 9 1
541,920	20	Oct. 30	3½	Monte Video, Ltd.	11½—12	..	5 16 8
1,775,892	Stk.	July 26	4½	Newc'tle&G'tesh'd Con.	99½—100½	+¼	4 7 1
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	87—88	..	3 19 7
55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13½—14½	..	5 1 5
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	125—130*	..	6 3 1
60,000	5	Sept. 27	10	Ottoman, Ltd.	8¾—8¾	..	5 14 3
60,000	50	Aug. 14	13	Portsea Island B	127—130	..	5 0 0
100,000	50	,,	12	Do. C	124—127	..	4 14 6
249,980	5	Oct. 11	8	Primitiva Ord.	6¼—6½	..	5 18 6
499,960	5	June 28	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
521,600	100	Dec. 2	4	Do. 4 p.c. Deb.	94—96*	..	4 3 4
346,198	Stk.	June 28	4	River Plate 4 p.c. Deb.	94—96	..	4 3 4
275,000	5	Apl. 12	12	San Paulo, Ltd.	13—14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½—12	..	5 0 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Aug. 29	10	Sheffield A	230—232	..	4 6 2
209,984	,,	,,	10	Do. B	230—232	..	4 6 2
523,500	,,	,,	10	Do. C	229—231	..	4 6 7
90,000	10	Sept. 27	7½	South African	9½—10½	+½	7 2 10
6,429,895	Stk.	Aug. 29	5/9/4	South Met., 4 p.c. Ord.	117—119	+½	4 11 9
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	76—79	..	3 15 11
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	163—165	..	5 3 0
605,000	Stk.	Aug. 14	5/16/8	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 16 3
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—119	..	4 4 0
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120—122	..	4 2 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Aug. 14	7½	Tottenham A 5 p.c. and B 3½ p.c.	142—145	..	5 0 0
483,940	,,	,,	5½		115—117	+1	4 18 3
149,470	,,	June 28	4	Edmonton 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8½—8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	115—115½	..	4 6 7
255,636	Stk.	Aug. 29	6⅝	Wands- worth B 3½ p.c.	139—142	..	4 16 10
85,766	,,	June 28	3	Do. 3 p.c. Deb. Stk.	70—72	..	4 3 4

Prices Marked * are "Ex. Div."